PROJECT MANUAL

Upgrades and Renovations
Missouri Veterans Home
Cape Girardeau, Missouri

DESIGNED BY: Farnsworth Group, Inc.
20 Allen Ave., Suite 200
St. Louis, MO 63119

DATE ISSUED: 7/24/2019
PROJECT NO.: U1805-01
FEDERAL PROJECT: FAI 29-043

FOR: State of Missouri
Office of Administration
Division of Facilities Management,
Design and Construction
SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: (#U1805-01) Missouri Veterans Home
2400 Veterans Memorial Dr.
Cape Girardeau, MO 63701

THE FOLLOWING DESIGN PROFESSIONALS HAVE SIGNED AND SEALED THE ORIGINAL PLANS AND SPECIFICATIONS FOR THIS PROJECT, WHICH ARE ON FILE WITH THE DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION:

1.1 DESIGN PROFESSIONALS OF RECORD

A. Civil Engineer:

1. Farnsworth Group, Inc.
3. Michelina S. Hansel
4. License # 2007020272
5. Responsible for Divisions 31-33 Sections except where indicated as prepared by other design professionals of record.

Expiration Date: 12/31/2019
B. Landscape Architect:

1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 000744. Architecture
3. Jacob L. Heck
4. License # 2018034567
5. Responsible for Divisions 32 Sections except where indicated as prepared by other design professionals of record.

Expiration Date: 12/31/2020

C. Structural Engineer:

1. Farnsworth Group, Inc.
3. Dustin Kyle Sweet
4. License # 2013027948
5. Responsible for Divisions 03-06 Sections except where indicated as prepared by other design professionals of record.

Expiration Date: 12/31/2019
D. Architect:

1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 000744. Architecture
3. Nicholas Ryan Bruner
4. License # 2018007676
5. Responsible for Divisions 01-10 Sections except where indicated as prepared by other design professionals of record.

Expiration Date: 12/31/2020

E. Fire Protection, Mechanical, and Plumbing Engineer:

1. Farnsworth Group, Inc.
3. Joseph Gaied
4. License 2013030721
5. Responsible for Division 21, 22 and 23 as applicable to Plumbing.

Expiration Date: 12/31/2019
F. Electrical Engineer:

1. Farnsworth Group, Inc.
3. Brian M. Snyder
4. License 2013000631
5. Responsible for Division 26 as applicable to Electrical.

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**DIVISION 31 - EARTHWORK**

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**DIVISION 32 - EXTERIOR IMPROVEMENTS**

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**DIVISION 33 - UTILITIES**

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<td>Site Water Utility Distribution Piping</td>
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SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section provides a comprehensive list of the drawings that comprise the Bid Documents for this project.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

A. The following list of drawings is a part of the Bid Documents:

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<tr>
<th>SHEET #</th>
<th>TITLE</th>
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<td></td>
<td>ALL DRAWINGS DATE 07-24-19</td>
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**GENERAL**

| G-001  | COVER                                      |
| G-002  | GENERAL INFORMATION                        |
| G-003  | FIRST FLOOR LIFE SAFETY PLAN              |
| G-004  | PHASING PLAN                               |

**CIVIL**

| C-001  | CIVIL GENERAL NOTES                        |
| C-002  | EXISTING CONDITIONS                        |
| C-003  | DEMOLITION                                 |
| C-004  | LAYOUT AND HARDSCAPE PLAN                  |
| C-005  | PAVEMENT JOINTING                          |
| C-006  | GRADING AND UTILITY PLAN                   |
| C-007  | FENCE LAYOUT – ALTERNATE #2                |
| C-008  | DETAILS                                    |

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| L-101  | HARDSCAPE MATERIALS PLAN - NORTH           |
| L-102  | HARDSCAPE MATERIALS PLAN - SOUTH           |
| L-201  | HARDSCAPE DETAILS                          |
| L-202  | HARDSCAPE DETAILS                          |
| L-301  | PLANTING PLAN - NORTH                      |
| L-302  | PLANTING PLAN - SOUTH                      |
| L-401  | PLANTING DETAILS                           |
| L-402  | PLANT SCHEDULE                             |
UPGRADES AND RENOVATIONS CAPE GIRARDEAU VETERANS HOME  
U1805-01  
FAI 29-043  
FGI PROJECT NO: 0180821.00

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S-401 FRAMING DETAILS
S-402 FRAMING DETAILS
S-403 FRAMING DETAILS
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S-601 MASONRY DETAILS

ARCHITECTURAL
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A-002 FIRE RATED ASSEMBLIES
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A-103 ENLARGED DEMO PLAN - WING A
A-104 ENLARGED DEMO PLAN - WING B
A-105 ENLARGED DEMO PLAN - WING C
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A-107 ROOF DEMO PLAN
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A-115 ENLARGED PLANS
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A-404 WALL SECTIONS
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A-704 ENLARGED DEMO REFLECTED CEILING PLAN - WING B
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A-709 ENLARGED REFLECTED CEILING PLAN - WING B
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I-305 INTERIOR SIGNAGE DETAILS

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F-102 WING A PARTIAL FIRE PROTECTION PLAN
F-103 WING B PARTIAL FIRE PROTECTION PLAN
F-104 WING C PARTIAL FIRE PROTECTION PLAN
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- P-104 WING C PARTIAL PLUMBING DEMOLITION PLAN
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- P-106 WING A PARTIAL PLUMBING PLAN
- P-107 WING B PARTIAL PLUMBING PLAN
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- M-106 CENTRAL CORE VENTILATION PLAN
- M-107 WING A VENTILATION PLAN
- M-108 WING B VENTILATION PLAN
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- M-110 MECHANICAL ROOF PLAN
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- M-113 ALTERNATE 1 - PAVILION MECHANICAL PLAN
- M-301 MECHANICAL SECTIONS
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- M-502 MECHANICAL DETAILS
- M-503 MECHANICAL DETAILS
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- E-002 ELECTRICAL GENERAL NOTES AND ABBREVIATIONS
- E-101 LIGHTING DEMOLITION PLAN - CORE
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- E-104 LIGHTING DEMOLITION PLAN - WING C
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- E-109 SYSTEMS DEMOLITION PLAN - CORE
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E-111 SYSTEMS DEMOLITION PLAN - WING B
E-112 SYSTEMS DEMOLITION PLAN - WING C
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E-501 ELECTRICAL DETAILS
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E-602 ELECTRICAL SCHEDULES
E-603 ELECTRICAL SCHEDULES
E-604 ELECTRICAL SCHEDULES WING A
E-605 ELECTRICAL SCHEDULES WING B
E-606 ELECTRICAL SCHEDULES WING C
E-607 ELECTRICAL SCHEDULES
E-608 ELECTRICAL SCHEDULES

END OF SECTION 000115
SECTION 001116 - INVITATION FOR BID

1.0 OWNER:
A. The State of Missouri
   Office of Administration,
   Division of Facilities Management, Design and Construction
   Jefferson City, Missouri

2.0 PROJECT TITLE AND NUMBER:
A. Upgrades and Renovations
   Missouri Veterans Home
   Cape Girardeau, Missouri
   Project No.: U1805-01 (FAI 29-043)

3.0 BIDS WILL BE RECEIVED:
A. Until: 1:30 PM, Tuesday, January 28, 2020
B. Only electronic bids on MissouriBUYS shall be accepted: https://missouribuys.mo.gov. Bidder must be registered to bid.

4.0 DESCRIPTION:
A. Scope: The project includes security upgrades to the lobby; Door and frame replacement; Room expansion in the main dining room and special care dining area; Remodeled canteen area; New storage rooms on wings; New oxygen room; Resident room interior finishes including: replacement of flooring, drywall, wall protection, specialized lighting, cabinetry, wall framing to receive television mounting brackets, and electrical. Flooring, drywall, handrails, ceiling tile, wall protection, and baseboard replacement throughout the facility. Replace vinyl siding and soffits.
B. Estimate: $6,800,000.00 to $9,500,000.00
C. MBE/WBE/SDVE Goals: MBE 10.00%, WBE 10.00%, & SDVE 3.00%
   NOTE: Only MBE/WBE firms certified by a State of Missouri public entity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.
D. **NOTE: Bidders are provided new Good Faith Effort (GFE) forms on MissouriBUYS.

5.0 PRE-BID MEETING:
A. Place/Time: 02:30 PM; Thursday, January 9, 2020; Missouri Veterans Home, 2400 Veterans Memorial Drive, Cape Girardeau, Missouri.
B. Access to State of Missouri property requires presentation of a photo ID by all persons

6.0 HOW TO GET PLANS & SPECIFICATIONS:
A. View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of $200 from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, https://www.adsplanroom.net. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. Bidder must secure at least one bid set to become a planholder.
B. Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.
C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction’s web site: https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

7.0 POINT OF CONTACT:
A. Designer: Farnsworth Group, Inc., Nicholas Bruner, phone # 618-236-2000, fax # 314-962-1253
B. Project Manager: Sandra Walther, phone # 573-751-2283, fax # 573-751-7277

8.0 GENERAL INFORMATION:
A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.
B. Bid results will be available at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans after it is verified that at least one bid is awardable and affordable.
Very Important MissouriBUYS Instructions to Help Submit a Bid Correctly

A. The bidder shall submit his or her bid and all supporting documentation on MissouriBUYS eProcurement System. No hard copy bids shall be accepted. Go to https://missouribuys.mo.gov and register. The bidder must register before access is granted to the solicitation details and bidding is possible, however, the bidder can review a summary of the project by selecting “Bid Board” and then checking off “Open” under “Status” and “OA-FMDC-Contracts Chapter 8” under “Organization” in the boxes shown on the left margin.

B. Once registered, log in.
2. Under “Filter by Agency” select “OA-FMDC-Contracts Chapter 8.”
4. Above the dark blue bar, select “Other Active Opportunities.”
5. To see the Solicitation Summary, single click the Opp. No. (Project Number) and the summary will open. Single quick click each blue bar to open detailed information.

C. Here are simplified instructions for uploading the bid to MissouriBUYS:
1. Find the solicitation by completing Steps 1 through 4 above.
2. Select the three dots under “Actions.” Select “Add New Response.”
3. When the Quote box opens, give the response a title and select “OK.”
4. The detailed solicitation will open. Select “Check All” for the Original Solicitation Documents, open each document, and select “Accept.” If this step is not completed, a bid cannot be uploaded. Scroll to the bottom of the page and select “Add Attachments.” If you do not see this command, not all documents have been opened and accepted.
5. The Supplier Attachments box will open. Select “Add Attachment” again.
6. The Upload Documents box will open. Read the instructions for uploading. Disregard the “Confidential” check box.
7. Browse and attach up to 5 files at a time. Scroll to bottom of box and select “Upload.” The Supplier Attachments box will open. Repeat Steps 5 through 7 if more than 5 files are to be uploaded.
8. When the Supplier Attachments box opens again and uploading is complete, select “Done.” A message should appear that the upload is successful. If it does not, go to the Bidder Response tab and select “Submit.”
9. The detailed solicitation will open. At the bottom select “Close.”

D. Any time a bidder wants to modify the bid, he or she will have to submit a new one. FMDC will open the last response the bidder submits. The bidder may revise and submit the bid up to the close of the solicitation (bid date and time). Be sure to allow for uploading time so that the bid is successfully uploaded prior to the 1:30 PM deadline; we can only accept the bid if it is uploaded before the deadline.

E. If you want to verify that you are uploading documents correctly, we encourage you to submit a fake bid early. Label the fake bid as such to distinguish it from the real bid. The contracts person you contact will let you know if your “bid” was received successfully. Please contact Drew Henrickson: 573-751-8128, drew.henrickson@oa.mo.gov; Marlene Blackburn: 573-522-6035, marlene.blackburn@oa.mo.gov; or Kelly Copeland: 573-522-2283, kelly.copeland@oa.mo.gov.

F. If you are experiencing login issues, please contact Web Procure Support (Proactis) at 866-889-8533 anytime from 7:00 AM to 7:00 PM Central Time, Monday through Friday. If you try using a userid or password several times that is incorrect, the system will lock you out. Web Procure Support is the only option to unlock you! If you forget your userid or password, Web Procure Support will provide a temporary userid or password. Also, if it has been a while since your last successful login and you receive an “inactive” message, contact Web Procure (Proactis). If you are having a registration issue, you may contact Cathy Holliday at 573-751-3491 or by email: cathy.holliday@oa.mo.gov.
1.0 - SPECIAL NOTICE TO BIDDERS
   A. If awarded a contract, the Bidder’s employees, and the employees of all subcontractors, who perform the work on the project, will be required to undergo a fingerprint background check and obtain a State of Missouri identification badge prior to beginning work on site. The Bidder should review the information regarding this requirement in Section 013513 – Site Security and Health Requirements prior to submitting a bid.
   B. The Bidder’s prices shall include all city, state, and federal sales, excise, and similar taxes that may lawfully be assessed in connection with the performance of work, and the purchased of materials to be incorporated in the work. THIS PROJECT IS NOT TAX EXEMPT.

2.0 - BID DOCUMENTS
   A. The number of sets obtainable by any one (1) party may be limited in accordance with available supply.
   B. For the convenience of contractors, sub-contractors and suppliers, copies of construction documents are on file at the office of the Director, Division of Facilities Management, Design and Construction and on the Division’s web site - https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

3.0 - BIDDERS' OBLIGATIONS
   A. Bidders must carefully examine the entire site of the work and shall make all reasonable and necessary investigations to inform themselves thoroughly as to the facilities available as well as to all the difficulties involved in the completion of all work in accordance with the specifications and the plans. Bidders are also required to examine all maps, plans and data mentioned in the specifications. No plea of ignorance concerning observable existing conditions or difficulties that may be encountered in the execution of the work under this contract will be accepted as an excuse for any failure or omission on the part of the contractor to fulfill in every detail all of the requirements of the contract, nor accepted as a basis for any claims for extra compensation.
   B. Under no circumstances will contractors give their plans and specifications to another contractor. Any bid received from a contractor whose name does not appear on the list of plan holders may be subject to rejection.

4.0 - INTERPRETATIONS
   A. No bidder shall be entitled to rely on oral interpretations as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than five (5) working days before opening of bids. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.
   B. Approval for an “acceptable substitution” issued in the form of an addendum as per Paragraph 4A above, and as per Article 3.1 of the General Conditions; ACCEPTABLE SUBSTITUTIONS shall constitute approval for use in the project of the product.
   C. An “acceptable substitution” requested after the award of bid shall be approved if proven to the satisfaction of the Owner and the Designer as per Article 3.1, that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner.
   D. A request for “Acceptable Substitutions” shall be made on the Section 006325 Substitution Request Form. The request shall be sent directly to the project Designer. A copy of said request should also be mailed to the Owner, Division of Facilities Management, Design and Construction, Post Office Box 809, Jefferson City, Missouri 65102.

5.0 - BIDS AND BIDDING PROCEDURE
   A. Bidders shall submit all submission forms and accompanying documents listed in SECTION 004113 – BID FORM, Article 5.0, ATTACHMENTS TO BID by the stated time or their bid will be rejected for being non-responsive.
Depending on the specific project requirements, the following is a GENERIC list of all possible bid forms that may be due with bid submittals and times when they may be due. Please check for specific project requirements on the proposal form (Section 004113). Not all of the following bid forms may be required to be submitted.

**Bid Submittal – due before stated date and time of bid opening (see IFB):**

- 004113 Bid Form (all pages are always required)
- 004322 Unit Prices Form
- 004336 Proposed Subcontractors Form
- 004337 MBE/WBE/SDVE Compliance Evaluation Form
- 004338 MBE/WBE/SDVE Eligibility Determination for Joint Ventures
- 004339 MBE/WBE/SDVE GFE Determination
- 004340 SDVE Business Form
- 004541 Affidavit of Work Authorization

**B.** All bids shall be submitted without additional terms and conditions, modification or reservation on the bid forms with each space properly filled. Bids not on these forms will be rejected.

**C.** All bids shall be accompanied by a bid bond executed by the bidder and a duly authorized surety company, certified check, cashier's check or bank draft made payable to the Division of Facilities Management, Design and Construction, State of Missouri, in the amount indicated on the bid form, Section 004113. Failure of the contractor to submit the full amount required shall be sufficient cause to reject his bid. The bidder agrees that the proceeds of the check, draft or bond shall become the property of the State of Missouri, if for any reason the bidder withdraws his bid after closing, or if on notification of award refuses or is unable to execute tendered contract, provide an acceptable performance and payment bond, provide evidence of required insurance coverage and/or provide required copies of affirmative action plans within ten (10) working days after such tender.

**D.** The check or draft submitted by the successful bidder will be returned after the receipt of an acceptable performance and payment bond and execution of the formal contract. Checks or drafts of all other bidders will be returned within a reasonable time after it is determined that the bid represented by same will receive no further consideration by the State of Missouri. Bid bonds will only be returned upon request.

### 6.0 - SIGNING OF BIDS

**A.** A bid from an individual shall be signed as noted on the Bid Form.

**B.** A bid from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture or an attorney-in-fact. If the bid is signed by an officer of a joint venture or an attorney-in-fact, a document evidencing the individual's authority to execute contracts should be included with the bid form.

**C.** A bid from a limited liability company (LLC) shall be signed by a manager or a managing member of the LLC.

**D.** A bid from a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation manually written. Title of office held by the person signing for the corporation shall appear, along with typed name of said individual. Corporate license number shall be provided and, if a corporation organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached. In addition, for corporate proposals, the President or Vice-President should sign as the bidder. If the signator is other than the corporate president or vice president, the bidder must provide satisfactory evidence that the signator has the legal authority to bind the corporation.

**E.** A bid should contain the full and correct legal name of the Bidder. If the Bidder is an entity registered with the Missouri Secretary of State, the Bidder’s name on the bid form should appear as shown in the Secretary of State’s records.

**F.** The Bidder should include its corporate license number on the Bid Form and, if the corporation is organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached to the bid form.
7.0 - RECEIVING BID SUBMITTALS

A. It is the bidder’s sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the Invitation for Bid. Bids received after the date and time specified shall not be considered by the Owner.

B. Bids must be submitted through the MissouriBUYS statewide eProcurement system (https://www.missouribuys.mo.gov/) in accordance with the instructions for that system. The Owner shall only accept bids submitted through MissouriBUYS. Bids received by the Owner through any other means, including hard copies, shall not be considered and will be discarded by the Owner unopened.

C. To respond to an Invitation for Bid, the Bidder must first register with MissouriBUYS by going through the MissouriBUYS Home Page (https://www.missouribuys.mo.gov/), clicking the “Register” button at the top of the page, and completing the Vendor Registration. Once registered, the Bidder accesses its account by clicking the “Login” button at the top of the MissouriBUYS Home Page. Enter your USERID and PASSWORD, which the Bidder will select. Under Solicitations, select “View Current Solicitations.” A new screen will open. Under “Filter by Agency” select “OA-FMDC-Contracts Chapter 8.” Under “Filter by Opp. No.” type in the State Project Number. Select “Submit.” Above the dark blue bar, select “Other Active Opportunities.” To see the Solicitation Summary, single click the Opp. No. (Project Number) and the summary will open. Single quick click each blue bar to open detailed information. The Bidder must read and accept the Original Solicitation Documents and complete all identified requirements. The Bidder should download and save all of the Original Solicitation Documents on its computer so that the Bidder can prepare its response to these documents. The Bidder should upload its completed response to the downloaded documents as an attachment to the electronic solicitation response.

D. Step-by-step instructions for how a registered vendor responds to a solicitation electronically are provided in Section 001116 – Invitation For Bid.

E. The Bidder shall submit its bid on the forms provided by the Owner on MissouriBUYS with each space fully and properly completed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner may reject bids that are not on the Owner’s forms or that do not contain all requested information.

F. No Contractor shall stipulate in his bid any conditions not contained in the specifications or standard bid form contained in the contract documents. To do so may subject the Contractor’s bid to rejection.

G. The completed forms shall be without interlineations, alterations or erasures.

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

A. Bidder may withdraw his bid at any time prior to scheduled closing time for receipt of bids, but no bidder may withdraw his bid for a period of twenty (20) working days after the scheduled closing time for receipt of bids.

B. The Bidder shall modify his or her original bid by submitting a revised bid on MissouriBUYS.

9.0 - AWARD OF CONTRACT

A. The Owner reserves the right to reject any and/or all bids and further to waive all informalities in bidding when deemed in the best interest of the State of Missouri.

B. The Owner reserves the right to let other contracts in connection with the work, including but not by way of limitation, contracts for the furnishing and installation of furniture, equipment, machines, appliances and other apparatus.

C. In awarding the contract the Owner may take into consideration the bidder's skill, facilities, capacity, experience, responsibility, previous work record, financial standing and the necessity of prompt and efficient completion of work herein described. Inability of any bidder to meet the requirements mentioned above may be cause for rejection of his bid. However, no contract will be awarded to any individual,
partnership or corporation, who has had a contract with the State of Missouri declared in default within the preceding twelve months.

D. Award of alternates, if any, will be made in numerical order unless all bids received are such that the order of acceptance of alternates does not affect the determination of the low bidder.

E. No bid shall be considered binding upon the Owner until the written contract has been properly executed, a satisfactory bond has been furnished, evidence of required insurance coverage, submittal of executed Section 004541, Affidavit of Work Authorization form, documentation evidencing enrollment and participation in a federal work authorization program has been received and an affirmative action plan submitted. Failure to execute and return the contract and associated documents within the prescribed period of time shall be treated, at the option of the Owner, as a breach of bidder's obligation and the Owner shall be under no further obligation to bidder.

F. If the successful bidder is doing business in the State of Missouri under a fictitious name, he shall furnish to Owner, attached to the Bid Form, a properly certified copy of the certificate of Registration of Fictitious Name from the State of Missouri, and such certificate shall remain on file with the Owner.

G. Any successful bidder which is a corporation organized in a state other than Missouri shall furnish to the Owner, attached to the Bid Form, a properly certified copy of its current Certificate of Authority to do business in the State of Missouri, such certificate to remain on file with the Owner. No contract will be awarded by the Owner unless such certificate is furnished by the bidder.

H. Any successful bidder which is a corporation organized in the State of Missouri shall furnish at its own cost to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.

I. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the Missouri Department of Revenue. No contract will be awarded by the Owner unless the successful bidder certifies that he has complied with all applicable provisions of Section 285.230-234.

J. Sections 285.525 and 285.530, RSMo, require business entities to enroll and participate in a federal work authorization program in order to be eligible to receive award of any state contract in excess of $5,000. Bidders should submit with their bid an Affidavit of Work Authorization (Section 004541) along with appropriate documentation evidencing such enrollment and participation. Section-004541, Affidavit of Work Authorization is located on the MissouriBUYS solicitation for this project. Bidders must also submit an E-Verify Memorandum before the Owner may award a contract to the Bidder. Information regarding a E-Verify is located at https://www.uscis.gov/e-verify/. The contractor shall be responsible for ensuring that all subcontractors and suppliers associated with this contract enroll in E-Verify.

10.0 - CONTRACT SECURITY

A. The successful bidder shall furnish a performance/payment bond as set forth in General Conditions Article 6.1 on a condition prior to the State executing the contract and issuing a notice to proceed.

11.0 - LIST OF SUBCONTRACTORS

A. If required by “Section 004113 – Bid Form,” each bidder must submit as part of their bid a list of subcontractors to be used in performing the work (Section 004336). The list must specify the name of the single designated subcontractor, for each category of work listed in “Section 004336 - Proposed Subcontractors Form.” If work within a category will be performed by more than one subcontractor, the bidder must provide the name of each subcontractor and specify the exact portion of the work to be done by each. Failure to list the Bidder’s firm, or a subcontractor for each category of work identified on the Bid Form or the listing of more than one subcontractor for any category without designating the portion of work to be performed by each shall be cause for rejection of the bid. If the bidder intends to perform any of the designated subcontract work with the use of his own employees, the bidder shall make that fact clear, by listing his own firm for the subject category. If any category of work is left vacant, the bid shall be rejected.

12.0 - WORKING DAYS

A. Contract duration time is stated in working days and will use the following definition in determining the actual calendar date for contract completion:

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

A. By signing the bid form and submitting a bid on this project, the Bidder certifies that it will use American and Missouri products as set forth in Article 1.7 of the General Conditions. Bidders are advised to review those requirements carefully prior to bidding.

B. A preference shall be given to Missouri firms, corporations or individuals, or firms, corporations or individuals that maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less.

C. Pursuant to Section 34.076, RSMo, a contractor or Bidder domiciled outside the boundaries of the State of Missouri shall be required, in order to be successful, to submit a bid the same percent less than the lowest bid submitted by a responsible contractor or Bidder domiciled in Missouri as would be required for such a Missouri domiciled contractor or Bidder to succeed over the bidding contractor or Bidder domiciled outside Missouri on a like contract or bid being let in the person's domiciliary state and, further, the contractor or Bidder domiciled outside the boundaries of Missouri shall be required to submit an audited financial statement as would be required of a Missouri domiciled contractor or Bidder on a like contract or bid being let in the domiciliary state of that contractor or Bidder.

14.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

1. “MBE” means a Minority Business Enterprise.

2. “MINORITY” has the same meaning as set forth in 1 C.S.R. 10-17.010.

3. “MINORITY BUSINESS ENTERPRISE” has the same meaning as set forth in section 37.020, RSMo.


5. “WOMEN’S BUSINESS ENTERPRISE” has the same meaning as set forth in section 37.020, RSMo.


7. “SERVICE-DISABLED VETERAN” has the same meaning as set forth in section 34.074, RSMo.

8. “SERVICE-DISABLED VETERAN ENTERPRISE” has the same meaning as “Service-Disabled Veteran Business” set forth in section 34.074, RSMo.

B. MBE/WBE/SDVE General Requirements:

1. For all bids greater than $100,000, the Bidder shall obtain MBE, WBE and SDVE participation in an amount equal to or greater than the percentage goals set forth in the Invitation for Bid and the Bid Form, unless the Bidder is granted a Good Faith Effort waiver by the Director of the Division, as set forth below. If the Bidder does not meet the MBE, WBE and SDVE goals, or make a good faith effort to do so, the Bidder shall be non-responsive, and its bid shall be rejected.

2. The Bidder should submit with its bid all of the information requested in the MBE/WBE/SDVE Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the Bidder intends to use for the contract work. The Bidder is required to submit all appropriate
MBE/WBE/SDVE documentation before the stated time and date set forth in the Invitation for Bid. If the Bidder fails to provide such information by the specified date and time, the Owner shall reject the bid.

3. The Director reserves the right to request additional information from a Bidder to clarify the Bidder’s proposed MBE, WBE, and/or SDVE participation. The Bidder shall submit the clarifying information requested by the Owner within two (2) Working Days of receiving the request for clarification.

4. Pursuant to section 34.074, RSMo, a Bidder that is a SDVE doing business as Missouri firm, corporation, or individual, or that maintains a Missouri office or place of business, shall receive a three-point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing the bid amount of the eligible SDVE by three percent of the apparent low responsive bidder’s bid. Based on this calculation, if the eligible SDVE’s evaluation is less than the apparent low responsive bidder’s bid, the eligible SDVE’s bid becomes the apparent low responsive bid. This reduction is for evaluation purposes only, and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded. In order to be eligible for the SDVE preference, the Bidder must complete and submit with its bid the Missouri Service Disabled Veteran Business Form, and any information required by the form. The form is available on the MissouriBUYS solicitation for this project.

A. Computation of MBE/WBE/SDVE Goal Participation:

1. A Bidder who is a MBE, WBE, or SDVE may count 100% of the contract towards the MBE, WBE or SDVE goal, less any amounts awarded to another MBE, WBE or SDVE. (NOTE: A MBE firm that bids as general contractor must obtain WBE and SDVE participation; a WBE firm that bids as a general contractor must obtain MBE and SDVE participation; and a SDVE firm that bids as general contractor must obtain MBE and WBE participation.) In order for the remaining contract amount to be counted towards the MBE, WBE or SDVE goal, the Bidder must complete the MBE/WBE/SDVE Compliance Evaluation Form (Section 004337) identifying itself as an MBE, WBE or SDVE.

2. The total dollar value of the work granted to a certified MBE, WBE or SDVE by the Bidder shall be counted towards the applicable goal.

3. Expenditures for materials and supplies obtained from a certified MBE, WBE, or SDVE supplier or manufacturer may be counted towards the MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.

4. The total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier may be counted towards a Bidder’s MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE properly assumes the actual and contractual responsibility for the work.

5. The total dollar value of work granted to a certified joint venture equal to the percentage of the ownership and control of the MBE, WBE, or SDVE partner in the joint venture may be counted towards the MBE/WBE/SDVE goals.

6. Only expenditures to a MBE, WBE, or SDVE that performs a commercially useful function in the work may be counted towards the MBE, WBE and SDVE goals. A MBE, WBE, or SDVE performs a commercially useful function when it is responsible for executing a distinct element of the work and carrying out its responsibilities by actually performing, managing and supervising the work or providing supplies or manufactured materials.

B. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri, Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Administration, Division of Purchasing and Material Management or by the Department of Veterans Affairs.
2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)’s online MBE/WBE directory (https://apps1.mo.gov/oeo/). The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Division of Purchasing and Materials Management’s online SDVE directory (http://oa.mo.gov/purchasing/vendor-information/missouri-service-disabled-veteran-business-enterprise-sdve-information) or the Department of Veterans Affairs’ directory (https://www.vip.vetbiz.gov/).

3. Additional information, clarifications, etc., regarding the listings in the directories may be obtained by calling the Division at (573)751-3339 and asking to speak to the Contract Specialist of record as shown in the Supplementary Conditions (Section 007300).

C. Waiver of MBE/WBE/SDVE Participation:

1. If a Bidder has made a good faith effort to secure the required MBE, WBE and/or SDVE participation and has failed, the Bidder shall submit with its bid the information requested in MBE/WBE/SDVE Good Faith Effort (GFE) Determination form. The GFE forms are located on the MissouriBUYs solicitation for this project. The Director will determine if the Bidder made a good faith effort to meet the applicable goals. If the Director determines that the Bidder did not make a good faith effort, the bid shall be rejected as being nonresponsive to the bid requirements. Bidders who demonstrate that they have made a good faith effort to include MBE, WBE, and/or SDVE participation will be determined to be responsive to the applicable participation goals, regardless of the percent of actual participation obtained, if the bid is otherwise acceptable.

2. In determining whether a Bidder has made a good faith effort to obtain MBE, WBE and/or SDVE participation, the Director may evaluate the factors set forth in 1 CSR 30-5.010(6)(C) and the following:
   a. The amount of actual participation obtained;
   b. How and when the Bidder contacted potential MBE, WBE, and SDVE subcontractors and suppliers;
   c. The documentation provided by the Bidder to support its contacts, including whether the Bidder provided the names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;
   d. If project information, including plans and specifications, were provided to MBE/WBE/SDVE subcontractors;
   e. Whether the Bidder made any attempts to follow-up with MBE, WBE or SDVE firms prior to bid;
   f. Amount of bids received from any of the subcontractors and/or suppliers that the Bidder contacted;
   g. The Bidder’s stated reasons for rejecting any bids;

3. If no bidder has obtained any participation in a particular category (MBE/WBE/SDVE) or made a good faith effort to do so, the Director may waive that goal rather than rebid.

D. Contractor MBE/WBE/SDVE Obligations

1. If awarded a contract, the Bidder will be contractually required to subcontract with or obtain materials from the MBE, WBE, and SDVE firms listed in its bid, in amounts equal to or greater than the dollar amount bid, unless the amount is modified in writing by the Owner.

2. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor’s bid, the Contractor must satisfactorily explain to the Director why it cannot comply
with the requirement and why failing meeting the requirement was beyond the Contractor's control. If the Director finds the Contractor's explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:

a. Declaring the Contractor ineligible to participate in any contracts with the Division for up to twelve (12) months (suspension); and/or

b. Declaring the Contractor be non-responsive to the Invitation for Bid, or in breach of contract and rejecting the bid or terminating the contract.

3. If the Contractor replaces an MBE, WBE, or SDVE during the course of this contract, the Contractor shall replace it with another MBE, WBE, or SDVE or make a good faith effort to do so. All MBE, WBE and SDVE substitutions must be approved by the Director.

4. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. At a minimum, the Contractor shall report the dollar-value of work completed by each MBE, WBE, or SDVE during the preceding month and the cumulative total of work completed by each MBE, WBE or SDVE to date with each monthly application for payment. The Contractor shall also make a final report, which shall include the total dollar-value of work completed by each MBE, WBE, and SDVE during the entire contract.
The MBE/WBE Directory for goods and services is maintained by the Office of Equal Opportunity (OEO). The current Directory can be accessed at the following web address:

https://apps1.mo.gov/MWBCertifiedFirms/

Please note that you may search by MBE, WBE, or both as well as by region, location of the business by city or state, as well as by commodity or service.

The SERVICE DISABLED VETERAN ENTERPRISE (SDVE) Directory (s) may be accessed at the following web addresses:

https://oa.mo.gov/sites/default/files/sdvelisting.pdf

https://www.vip.vetbiz.va.gov
THIS AGREEMENT, made (DATE) by and between:

Contractor Name and Address
hereinafter called the "Contractor,"

and the State of Missouri, hereinafter called the "Owner", represented by the Office of Administration, Division of Facilities Management, Design and Construction, on behalf of the Department of Public Safety, Missouri Veterans Commission.

WITNESSETH, that the Contractor and the Owner, for the consideration stated herein agree as follows:

ARTICLE 1. STATEMENT OF WORK

The Contractor shall furnish all labor and materials and perform all work required for furnishing and installing all labor, materials, equipment and transportation and everything necessarily inferred from the general nature and tendency of the plans and specifications for the proper execution of the work for:

Project Name:          Upgrades and Renovations
Missouri Veterans Home
Cape Girardeau, Missouri

Project Number:        U1805-01 (FAI 29-043)

in strict accordance with the Contract Documents as enumerated in Article 7, all of which are made a part hereof.

ARTICLE 2. TIME OF COMPLETION

The contract performance time is 260 working days from the transmittal date of this agreement. The contract completion date is MONTH, DAY, YEAR. This time includes ten (10) working days for the Contractor to receive, sign and return the contract form along with required bonding and insurance certificates. Failure of the Contractor to provide correct bonding and insurance within the ten (10) working days shall not be grounds for a time extension. Receipt of proper bonding and insurance is a condition precedent to the formation of the contract and if not timely received, may result in forfeiture of the Contractor's bid security. Work may not commence until the Owner issues a written Notice to Proceed and must commence within seven (7) working days thereafter.

ARTICLE 3. LIQUIDATED DAMAGES

Whenever time is mentioned in this contract, time shall be and is of the essence of this contract. The Owner would suffer a loss should the Contractor fail to have the work embraced in this contract fully completed on or before the time above specified. THEREFORE, the parties hereto realize in order to adjust satisfactorily the damages on account of such failure that it might be impossible to compute accurately or estimate the amount of such loss or damages which the Owner would sustain by reason of failure to complete fully said work within the time required by this contract. The Contractor hereby covenants and agrees to pay the Owner, as and for liquidated damages, the sum of $1,000 per day for each and every day, Sunday and legal holidays excepted, during which the work remains incomplete and unfinished. Any sum which may be due the Owner for such damages shall be deducted and retained by the Owner from any balance which may be due the Contractor when said work shall have been finished and accepted. But such provisions shall not release the Bond of the Contractor from liability according to its terms. In case of failure to complete, the Owner will be under no obligation to show or prove any actual or specific loss or damage.
ARTICLE 4. CONTRACT SUM
The Owner shall pay the Contractor for the prompt, faithful and efficient performance of the conditions and undertakings of this contract, subject to additions, and deductions as provided herein, in current funds the sum of:

Base Bid: $  

The Owner accepts the following Alternate Bids:

Alternate One: $  

TOTAL CONTRACT AMOUNT: (S$CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices: NOT APPLICABLE

ARTICLE 5. PREVAILING WAGE RATE
It is understood and agreed by and between the parties that not less than the prevailing hourly rate of wages shall be paid for work of a similar character in the locality in which the work is performed, and not less than the prevailing hourly rate of wages for legal holiday and overtime work in the locality in which the work is performed, both as determined by the Department of Labor and Industrial Relations or as determined by the court on appeal, to all workmen employed by or on behalf of the Contractor or any subcontractor, exclusive of maintenance work. Only such workmen as are directly employed by the Contractor or his subcontractors, in actual construction work on the site shall be deemed to be employed.

When the hauling of materials or equipment includes some phase of the construction other than the mere transportation to the site of the construction, workmen engaged in this dual capacity shall be deemed to be employed directly on the project and entitled to the prevailing wage.

ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION
The Contractor has been granted a waiver of the 10% MBE and 10% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

The Contractor has met the MBE/WBE/SDVE participation goals and agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows:

MBE/WBE/SDVE Firm: Subcontract Amt:  

MBE/WBE/SDVE Firm: Subcontract Amt:  

MBE/WBE/SDVE Firm: Subcontract Amt:  

Total $  

MBE/WBE/SDVE assignments identified above shall not be changed without a Contract Change signed by the Owner.

The Director of the Division of Facilities Management, Design and Construction or his Designee shall be the final authority to resolve disputes and disagreements between the Contractor and the MBE/WBE/SDVE firms listed above when such disputes impact the subcontract amounts shown above.
ARTICLE 7. CONTRACT DOCUMENTS

Contract documents shall consist of the following component parts:

1. Division 0, with executed forms
2. Division 1
3. Executed Construction Contract Form
4. The Drawings
5. The Technical Specifications
6. Addenda
7. Contractor's Proposal as accepted by the Owner

By signature below, the parties hereby execute this contract document.

APPROVED:

________________________________________
Mark Hill, P.E., Director
Division of Facilities Management,
Design and Construction

________________________________________
Contractor’s Authorized Signature

DELETE IF PRIVATE OR PARTNERSHIP

I, Corporate Secretary, certify that I am Secretary of the corporation named above and that (CONTRACTOR NAME), who signed said contract on behalf of the corporation, was then (TITLE) of said corporation and that said contract was duly signed for and in behalf of the corporation by authority of its governing body, and is within the scope of its corporate powers.

________________________________________
Corporate Secretary
STATE OF MISSOURI  
OFFICE OF ADMINISTRATION  
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION  
AFFIDAVIT FOR AFFIRMATIVE ACTION

NAME: 

First being duly sworn on oath states: that

he/she is the □ sole proprietor □ partner □ officer or □ manager or managing member of

NAME: 

a □ sole proprietorship □ partnership □ limited liability company (LLC)

or □ corporation, and as such, said proprietor, partner, or officer is duly authorized to make this affidavit on behalf of said sole proprietorship, partnership, or corporation; that under the contract known as

PROJECT TITLE: 

Less than 50 persons in the aggregate will be employed and therefore, the applicable Affirmative Action requirements as set forth in Article 1.4 of the General Conditions of the State of Missouri have been met.

PRINT NAME & SIGNATURE

DATE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSE SEAL

STATE OF: COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS DAY OF YEAR

NOTARY PUBLIC SIGNATURE

MY COMMISSION EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)
KNOW ALL MEN BY THESE PRESENTS, THAT we ____________________________________________________
as principal, and ___________________________________________________________________________________
_____________________________________________________________as Surety, are held and firmly bound unto the
STATE OF MISSOURI. in the sum of ________________________________ Dollars ($                                          )
for payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly
and severally, firmly by these presents.

WHEREAS, the Principal has, by means of a written agreement dated the ____________________________
day of___________________________________, 20_______, enter into a contract with the State of Missouri for
_________________________________________________________________________________________________
_________________________________________________________________________________________________
_________________________________________________________________________________________________
(Insert Project Title and Number)

NOW, THEREFORE, if the Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and
agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the State of
Missouri, with or without notice to the Surety and during the life of any guaranty required under the contract; and shall also faithfully
perform and fulfill all undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said
contract that may hereafter be made with or without notice to the Surety; and shall also promptly make payment for materials
incorporated, consumed or used in connection with the work set forth in the contract referred to above, and all insurance premiums,
both compensation and all other kinds of insurance, on said work, and for all labor performed on such work, whether by subcontractor
or otherwise, at not less than the prevailing hourly rate of wages for work of a similar character (exclusive of maintenance work) in the
locality in which the work is performed and not less than the prevailing hourly rate of wages for legal holiday and overtime work
(exclusive of maintenance work) in the locality in which the work is performed both as determined by the Department of Labor and
Industrial Relations or determined by the Court of Appeal, as provided for in said contract and in any and all duly authorized
modifications of said contract that may be hereafter made, with or without notice to the Surety; then, this obligation shall be void and
of no effect, but it is expressly understood that if the Principal should make default in or should fail to strictly, faithfully and
efficiently do, perform and comply with any or more of the covenants, agreements, stipulations, conditions, requirements or
undertakings, as specified in or by the terms of said contract, and with the time therein named, then this obligation shall be valid and
binding upon each of the parties hereto and this bond shall remain in full force and effect; and the same may be sued on at the instance
of any material man, laborer, mechanic, subcontractor, individual, or otherwise to whom such payment is due, in the name of the State
of Missouri, to the use of any such person.
AND, IT IS FURTHER specifically provided that any modifications which may hereinafter be made in the terms of the contract or in the work to be done under it or the giving by the Owner of any extension of the time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal to the other, shall not in any way release the Principal and the Surety, or either or any of them, their heirs, executors, administrators and successors, from their liability hereunder, notice to the Surety of any such extension, modifications or forbearance being hereby waived.

IN WITNESS WHEREOF, the above bounden parties have executed the within instrument this __________________ day of __________________, 20 ____.  

AS APPLICABLE:

AN INDIVIDUAL

Name: ______________________________________

Signature: _____________________________________

A PARTNERSHIP

Name of Partner: _______________________________

Signature of Partner: ____________________________

Name of Partner: _______________________________

Signature of Partner: ____________________________

CORPORATION

Firm Name: __________________________________

Signature of President: __________________________

SURETY

Surety Name: __________________________________

Attorney-in-Fact: _______________________________

Address of Attorney-in-Fact: ______________________

Telephone Number of Attorney-in-Fact: ______________________

Signature Attorney-in-Fact: ______________________

NOTE: Surety shall attach Power of Attorney
STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
PRODUCT SUBSTITUTION REQUEST

CHECK APPROPRIATE BOX

☐ SUBSTITUTION PRIOR TO BID OPENING
   (Minimum of (5) working days prior to receipt of Bids as per Article 4 – Instructions to Bidders)

☐ SUBSTITUTION FOLLOWING AWARD
   (Maximum of (20) working days from Notice to Proceed as per Article 3 – General Conditions)

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

Bidder/Contractor hereby requests acceptance of the following product or systems as a substitution in accordance with provisions of Division One of the Bidding Documents:

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

☐ Product data for proposed substitution is attached (include description of product, standards, performance, and test data)

☐ Sample  ☐ Sample will be sent, if requested

QUALITY COMPARISON

<table>
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<tr>
<th>SPECIFIED PRODUCT</th>
<th>SUBSTITUTION REQUEST</th>
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<td>NAME, BRAND</td>
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<td>CATALOG NO.</td>
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<td>MANUFACTURER</td>
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<td>VENDOR</td>
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PREVIOUS INSTALLATIONS

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<tr>
<th>PROJECT</th>
<th>ARCHITECT/ENGINEER</th>
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<tbody>
<tr>
<td>LOCATION</td>
<td>DATE INSTALLED</td>
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SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
REASON FOR SUBSTITUTION


DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

☐ YES  ☐ NO

IF YES, EXPLAIN


SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK

☐ YES  ☐ NO

BIDDER’S/CONTRACTOR’S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

We have investigated the proposed substitution. We believe that it is equal or superior in all respects to specified product, except as stated above; that it will provide the same Warranty as specified product; that we have included complete implications of the substitution; that we will pay redesign and other costs caused by the substitution which subsequently become apparent; and that we will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning as a result of the substitution.

BIDDER/CONTRACTOR  DATE

REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:


ARCHITECT/ENGINEER  DATE
KNOW ALL MEN BY THESE PRESENT THAT: hereinafter called “Subcontractor” who heretofore entered into an agreement with hereinafter called “Contractor”, for the performance of work and/or furnishing of material for the construction of the project entitled

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(Address of Project)

for the State of Missouri (Owner) which said subcontract is by this reference incorporated herein, in consideration of such final payment by Contractor.

DOES HEREBY:

1. ACKNOWLEDGE that they have been PAID IN FULL all sums due for work and materials contracted or done by their Subcontractors, Material Vendors, Equipment and Fixture Suppliers, Agents and Employees, or otherwise in the performance of the Work called for by the aforesaid Contract and all modifications or extras or additions thereto, for the construction of said project or otherwise.

2. RELEASE and fully, finally, and forever discharge the Owner from any and all suits, actions, claims, and demands for payment for work performed or materials supplied by Subcontractor in accordance with the requirements of the above referenced Contract.

1. REPRESENT that all of their Employees, Subcontractors, Material Vendors, Equipment and Fixture Suppliers, and everyone else has been paid in full all sums due them, or any of them, in connection with performance of said Work, or anything done or omitted by them, or any of them in connection with the construction of said improvements, or otherwise.

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents
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<tr>
<th>CHECK</th>
<th>MBE</th>
<th>WBE</th>
<th>SDVE</th>
<th>ITEM OF WORK</th>
<th>TOTAL AMOUNT OF SUBCONTRACT</th>
<th>$ AMOUNT &amp; % COMPLETE (PAID-TO-DATE)</th>
<th>CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER NAME, ADDRESS, CONTACT, AND PHONE NUMBER</th>
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THE PERCENTAGE AND DOLLAR AMOUNT OF THIS PROJECT THAT ARE TO BE MBE/WBE/SDVE AS INDICATED IN THE ORIGINAL CONTRACT: % and $ .
STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW

Before me, the undersigned Notary Public, in and for the County of ________________________________
State of ________________________________ personally came and appeared ________________________________

(NAME)

of the

(POSITION) (NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions
and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised
Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied
and there has been no exception to the full and completed compliance with said provisions and requirements
and with Wage Determination No: ________________________________ issued by the

Department of Labor and Industrial Relations, State of Missouri on the _______ day of _________ 20__

in carrying out the contract and working in connection with

(NAME OF PROJECT)

Located at ________________________________ in ________________________________ County

(NAME OF THE INSTITUTION)

Missouri, and completed on the _________ day of _________ 20__

SIGNATURE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER OR BLACK INK RUBBER STAMP SEAL

STATE

COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS

DAY OF

YEAR

USE RUBBER STAMP IN CLEAR AREA BELOW

NOTARY PUBLIC SIGNATURE

MY COMMISSION EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)
# GENERAL CONDITIONS

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SECTION 007213 - GENERAL CONDITIONS

A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.

B. The General Conditions are intended to define the relationship of the Owner, the Designer and the Contractor thereby establishing certain rules and provisions governing the operation and performance of the work so that the work may be performed in a safe, orderly, expeditious and workmanlike manner.

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

A. As used in these contract documents, the following terms shall have the meanings and refer to the parties designated in these definitions.

1. "COMMISSIONER": The Commissioner of the Office of Administration.

2. “CONSTRUCTION DOCUMENTS”: The “Construction Documents” shall consist of the Project Manual, Drawings and Addenda.

3. "CONSTRUCTION REPRESENTATIVE”: Whenever the term “Construction Representative” is used, it shall mean the Owner’s Representative at the work site.

4. "CONTRACTOR": Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.

5. "DESIGNER": When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.

6. "DIRECTOR": Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.


8. “INCIDENTAL JOB BURDENS”: Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.

9. "JOINT VENTURE": An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.

10. "OWNER": Whenever the term “Owner” is used, it shall mean the State of Missouri.

11. “PROJECT”: Wherever the term “Project” is used, it shall mean the work required to be completed by the construction contract.


13. "SUBCONTRACTOR": Party or parties who contract under, or for the performance of part or this entire Contract between the Owner and Contractor. The subcontract may or may not be direct with the Contractor.

14. "WORK": Labor, material, supplies, plant and equipment required to perform and complete the service agreed to by the Contractor in a safe, expeditious, orderly and workmanlike manner so that the project shall be complete and finished in the best manner known to each respective trade.


ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

A. In case of discrepancy between drawings and specifications, specifications shall govern. Should discrepancies in architectural drawings, structural drawings and mechanical drawings occur, architectural drawings shall govern and, in case of
B. Specifications are separated into titled divisions for convenience of reference only and to facilitate letting of contracts and subcontracts. The Contractor is responsible for establishing the scope of work for subcontractors, which may cross titled divisions. Neither the Owner nor Designer will establish limits and jurisdiction of subcontracts.

C. Figured dimensions take precedence over scaled measurements and details over smaller scale general drawings. In the event of conflict between any of the documents contained within the contract, the documents shall take precedence and be controlling in the following sequence: addenda, supplementary general conditions, general conditions, division 1 specifications, technical division specifications, drawings, bid form and instructions to bidders.

D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any incidental work which is obviously necessary to complete the project within the limits established by the drawings and specifications, although not shown on or described therein, shall be performed by the Contractor at no additional cost as a part of his contract.

E. Upon encountering conditions differing materially from those indicated in the contract documents, the Contractor shall promptly notify the Designer and Construction Representative in writing before such conditions are disturbed. The Designer shall promptly investigate said conditions and report to the Owner, with a recommended course of action. If conditions do materially differ and cause an increase or decrease in contract cost or time required for completion of any portion of the work, a contract change will be initiated as outlined in Article 4 of these General Conditions.

E. Only work included in the contract documents is authorized, and the Contractor shall do no work other than that described therein or in accordance with appropriately authorized and approved contract changes.

ARTICLE 1.3 - COMPLIANCE WITH LAWS, PERMITS, REGULATIONS AND INSPECTIONS

A. Since the Owner is the State of Missouri, municipal or political subdivisions, zoning ordinances, construction codes (other than licensing of trades), and other like ordinances are not applicable to construction on Owner’s property, and Contractor will not be required to submit drawings and specifications to any municipal or political subdivision, authority, obtain construction permits or any other licenses (other than licensing of trades) or permits from or submit to inspections by any municipality or political subdivision relating to the construction for this project. All permits or licenses required by municipality or political subdivision for operation on property not belonging to Owner shall be obtained by and paid for by Contractor. Each Contractor shall comply with all applicable laws, ordinances, rules and regulations that pertain to the work of this contract.

B. Contractors, subcontractors and their employees engaged in the businesses of electrical, mechanical, plumbing, carpentry, sprinkler system work, and other construction related trades shall be licensed to perform such work by the municipal or political subdivision where the project is located, if such licensure is required by local code. Local codes shall dictate the level (master, journeyman, and apprentice) and the number, type and ratio of licensed tradesmen required for this project within the jurisdiction of such municipal or political subdivision.

C. Equipment and controls manufacturers and their authorized service and installation technicians that do not maintain an office within the jurisdiction of the municipal or political subdivision but are a listed or specified contractor or subcontractor on this project are exempt from Paragraph 1.3 B above.

D. The Contractor shall post a copy of the wage determination issued for the project and included as a part of the contract documents, in a prominent and easily accessible location at the site of construction for the duration of the project.

E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

A. The Contractor and his subcontractors will not discriminate against individuals based on race, color, religion, national origin, sex, disability, or
age, but may use restrictions which relate to bona fide occupational qualifications. Specifically, the Contractor and his subcontractors shall not discriminate:

1. Against recipients of service on the basis of race, color, religion, national origin, sex, disability or age.
2. Against any employee or applicant, for employment on the basis of race, color, religion, national origin, sex or otherwise qualified disability status.
3. Against any applicant for employment or employee on the basis of age, where such applicant or employee is between ages 40 and 70 and where such Contractor employs at least 20 persons.
4. Against any applicant for employment or employee on the basis of that person's status as a disabled or Vietnam-era veteran.

The Contractor and his Subcontractors will take affirmative action to assure applicants for employment and employees are treated equally without regard to race, color, religion, national origin, sex, disability, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion and transfer; recruitment or recruitment advertising; and selection for training, including apprenticeship.

The Contractor and his Subcontractors will give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements.

B. The Contractor and his Subcontractors shall develop, implement, maintain and submit in writing to the Owner an affirmative action program if at least fifty (50) persons in the aggregate are employed under this contract. If less than fifty (50) persons in the aggregate are to be employed under this contract, the Contractor shall submit, in lieu of the written affirmative action program, a properly executed Affidavit for Affirmative Action in the form included in the contract specifications. For the purpose of this section, an "affirmative action program" means positive action to influence all employment practices (including, but not limited to, recruiting, hiring, promoting and training) in providing equal employment opportunity regardless of race, color, sex, national origin, religion, age (where the person affected is between age 40 and 70), disabled and Vietnam-era veteran status, and disability. Such "affirmative action program" shall include:

1. A written policy statement committing the total organization to affirmative action and assigning management responsibilities and procedures for evaluation and dissemination;
2. The identification of a person designated to handle affirmative action;
3. The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion and discipline;
4. The exclusion of discrimination from all collective bargaining agreements; and
5. Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

In the enforcement of this non-discrimination clause, the Owner may use any reasonable procedures available, including, but not limited to: requests, reports, site visits and inspection of relevant documents of contractors and subcontractors.

C. In the event of the Contractor's or his subcontractor's noncompliance with any provisions of this Article of the Contract, the Owner may cancel this contract in whole or in part or require the Contractor to terminate his contract with the subcontractor.

ARTICLE 1.5 - ANTI-KICKBACK

A. No employee of the division, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract or in any part hereof. No officer, employee, designer, attorney, or administrator of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

ARTICLE 1.6 - PATENTS AND ROYALTIES

A. The Contractor shall hold and save the Owner and its officers, agents, servants and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner; unless otherwise specifically stipulated in the contract documents.

B. If the Contractor uses any design, device or materials covered by letters, patent or copyright,
the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

A. By virtue of statutory authority a preference will be given to Missouri labor and to products of mines, forests and quarries of the state of Missouri when they are found in marketable quantities in the state, and all such materials shall be of the best quality and suitable character that can be obtained at reasonable market prices, all as provided for in Section 8.280, Missouri Revised Statutes and Cumulative Supplements.

B. Furthermore, pursuant to Section 34.076 Missouri Revised Statutes and Cumulative Supplements, a preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary state.

C. In accordance with the Missouri Domestic Products Procurement Act Section 34.350 RSMo and Cumulative Supplements any manufactured goods or commodities used or supplied in the performance of this contract or any subcontract thereto shall be manufactured, assembled or produced in the United States, unless the specified products are not manufactured, assembled or produced in the United States in sufficient quantities to meet the agency's requirements or cannot be manufactured, assembled or produced in the United States within the necessary time in sufficient quantities to meet the contract requirements, or if obtaining the specified products manufactured, assembled or produced in the United States would increase the cost of this contract for purchase of the product by more than ten percent.

ARTICLE 1.8 - COMMUNICATIONS

A. All notices, requests, instructions, approvals and claims must be in writing and shall be delivered to the Designer and copied to the Construction Representative for the project except as required by Article 1.12 Disputes and Disagreements, or as otherwise specified by the Owner in writing as stated in Section 012600. Any such notice shall be deemed to have been given as of the time of actual receipt.

B. The Contractor shall attend on-site progress and coordination meetings, as scheduled by the Construction Representative, no less than once a month.

C. The Contractor shall ensure that major subcontractors and suppliers shall attend monthly progress meetings as necessary to coordinate the work, and as specifically requested by the Construction Representative.

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

A. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner's Representative before the work is performed. If the Contractor fails to do this, and constructs any work which interferes with the work of another contractor, the Contractor shall remove any part conflicting and rebuild same, as directed by the Owner's Representative.

C. Each contractor shall be required to coordinate his work with other contractors so as to afford others reasonable opportunity for execution of their work. No contractor shall delay any other contractor by neglecting to perform contract work at the proper time. If any contractor causes delay to another, they shall be liable directly to that contractor for such delay in addition to any liquidated damages which might be due the Owner.

D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall
coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.

E. Each Contractor shall be responsible for damage done to Owner’s or other Contractor’s property by him/her or workers in his employ through their fault or negligence.

F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase “acts or omissions” as used in this section shall be defined to include, but not be limited to, any unreasonable delay on the part of any such contractors.

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

A. No assignment by Contractor of any amount or any part of this contract or of the funds to be received there under will be recognized unless such assignment has had the written approval of the Director and the surety has been given due notice of such assignment and has furnished written consent thereto. In addition to the usual recitals in assignment contracts, the following language must be set forth: "It is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor of this contract and to claims or liens for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms or corporations rendering such services or supplying such materials."

ARTICLE 1.11 - INDEMNIFICATION

A. Contractor agrees to indemnify and save harmless Owner and its respective commissioners, officers, officials, agents, consultants and employees and Designer, their agents, servants and employees, from and against any and all liability for damage arising from injuries to persons or damage to property occasioned by any acts or omissions of Contractor, any subcontractors, agents, servants or employees, including any and all expense, legal or otherwise, which may be incurred by Owner or Designer, its agents, servants or employees, in defense of any claim, action or suit.

B. The obligations of the Contractor under this paragraph shall not extend to the liability of the Designer, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, contract changes, design or specifications, or (2) giving of or the failure to give directions or instructions by the Designer, his agents or employees as required by this contract documents provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

A. It is hereby expressly agreed and understood that in case any controversy or difference of opinion arises during construction, best efforts will be given to resolution at the field level. Should those efforts be unsuccessful, the Contractor has the right to appeal in writing, the decision of the Director’s Designee to the Director at Room 730 Truman Building, P.O. Box 809, Jefferson City, Missouri 65102. The decision of the Director shall be final and binding on all parties.

ARTICLE 2 - OWNER/DESIGNER RESPONSIBILITIES

A. The Owner shall give all orders and directions contemplated under this contract relative to the execution of the work. During progress of work the Owner will be represented at the project site by the Construction Representative and/or Designer, whose responsibilities are to see that this contract is properly fulfilled.

B. The Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractors shall provide proper facilities for such access and for inspection and supervision.

C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice. The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.

D. If the Contractor fails to proceed at once with the correction of rejected defective materials or workmanship, the Owner may, by separate contract or otherwise, have the defects remedied or rejected. Materials removed from the site and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility
for correcting such work without additional compensation.

F. The Owner shall have the right to direct the Contractor to uncover any completed work.

1. If the Contractor fails to adequately notify the Construction Representative and/or Designer of an inspection as required by the Contract Documents, the Contractor shall, upon written request, uncover the work. The Contractor shall bear all costs associated with uncovering and again covering the work exposed.

2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet the requirements of this contract, the actual cost of labor and material necessarily involved in the examination and replacement plus 10% shall be allowed the Contractor.

G. The Designer shall give all orders and directions contemplated under this contract relative to the scope of the work and shall give the initial interpretation of the contract documents.

H. The Owner may file a written notice to the Contractor to dismiss immediately any subcontractors, project managers, superintendents, foremen, workers, watchmen or other employees whom the Owner may deem incompetent, careless or a hindrance to proper or timely execution of the work. The Contractor shall comply with such notice as promptly as practicable without detriment to the work or its progress.

I. If in the Owner’s judgment it becomes necessary at any time to accelerate work, when ordered by the Owner in writing, the Contractor shall redirect resources to such work items and execute such portions of the work as may be required to complete the work within the current approved contract schedule.

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

A. The Contractor may request use of any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner and Designer is equal in all respects to that named. Standard products of manufacturers other than those specified will be accepted when, prior to the ordering or use thereof, it is proven to the satisfaction of the Owner and Designer that they are equal in design, strength, durability, usefulness and convenience for the purpose intended.

B. Any changes required in the details and dimensions indicated on the drawings for the substitution of products other than those specified shall be properly made at the expense of the Contractor requesting the substitution or change.

C. The Contractor shall submit a request for such substitutions in writing to the Owner and Design within twenty (20) working days after the date of the "Notice to Proceed." Thereafter no consideration will be given to alternate forms of accomplishing the work. This Article does not preclude the Owner from exercising the provisions of Article 4 hereof.

D. Any request for substitution by the Contractor shall be submitted in accordance with SECTION 002113 - INSTRUCTIONS TO BIDDERS.

E. When a material has been approved, no change in brand or make will be permitted unless:

1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or

2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

A. The Contractor’s submittals must be submitted with such promptness as to allow for review and approval so as not to cause delay in the work. The Contractor shall coordinate preparation and processing of submittals with performance of construction activities.

Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

Submit four (4) copies to the Designer and additional copies as required for the subcontractors and material suppliers. Also provide copies to meet the requirements for maintenance manuals.

B. All subcontractors’ shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and schedules submitted without this evidence will be returned to the Contractor for resubmission.

C. The Contractor shall include with the shop drawing, a letter indicating any and all deviations from the drawings and/or specifications. Failure to notify the Designer of such deviations will be grounds for subsequent rejection of the related work or materials. If, in the opinion of the Designer, the deviations are not acceptable, the Contractor will be required to furnish the item as specified and indicated on the drawings.
D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer’s attention to the deviation, in writing, at the time of submission and the Designer has knowingly approved thereof. An approval of any such modification will be given only under the following conditions:

1. It is in the best interest of the Owner
2. It does not increase the contract sum and/or completion time
3. It does not deviate from the design intent
4. It is without prejudice to any and all rights under the surety bond.

E. No extension of time will be granted because of the Contractor's failure to submit shop drawings and schedules in ample time to allow for review, possible resubmission, and approval. Fabrication of work shall not commence until the Contractor has received approval. The Contractor shall furnish prints of approved shop drawings and schedules to all subcontractors whose work is in any way related to the work under this contract. Only prints bearing this approval will be allowed on the site of construction.

F. The Contractor shall maintain a complete file on-site of approved shop drawings available for use by the Construction Representative.

ARTICLE 3.3 – AS-BUILT DRAWINGS

A. The Contractor shall update a complete set of the construction drawings, shop drawings and schedules of all work monthly by marking changes, and at the completion of their work (prior to submission of request for final payment) note all changes and turn the set over to the Construction Representative. The updates shall show all addenda, all field changes that were made to adapt to field conditions, changes resulting from contract changes or supplemental instructions, and all locations of structures, buried installations of piping, conduit, and utility services. All buried and concealed items both inside and outside shall be accurately located as to depth and referenced to permanent features such as interior or exterior wall faces and dimensions shall be given in a neat and legible manner in a contrasting colored pencil or ink. If approved by the Designer, an electronic file format may be provided.

ARTICLE 3.4 – GUARANTY AND WARRANTIES

A. General Guaranty

1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.

2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting therefrom which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.

3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.

4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. Extended Warranty

Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year. Where a longer period is offered at no additional cost or called for in the specific equipment specifications, the longer period shall govern.

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

A. Immediately after equipment submittals are approved and no later than ten (10) working days prior to the substantial completion inspection, the Contractor shall provide to the Designer three (3)
copied operating instructions and service manuals, containing the following:
1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer's printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.
2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name place data, shop drawings and air and water balance reports.
4. Service Instructions: Provide the following information for all pieces of equipment.
   a. Recommended spare parts including catalog number and name of local supplier or factory representative.
   b. Belt sizes, types, and lengths.
   c. Wiring diagrams.
5. Manufacturer's Certificate of Warranty as described in Article 3.4.
6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.

B. Submission of operating instructions shall be done in the following manner.

1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.
2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.
3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.
4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.

B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.

C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and insure completion thereof within the time specified.

D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.

F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.

G. The Contractor must notify the Construction Representative at least one working day before
placing concrete or burying underground utilities, pipelines, etc.

H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.

I. The Contractor shall coordinate all work so there will not be prolonged interruptions of existing equipment operation. Any existing plumbing, heating, ventilating, air conditioning or electrical disconnections necessary for the project, which affect portions of this construction or building or any other building must be scheduled with the Construction Representative to minimize or avoid any disruption of facility operations. In no case, unless previously approved in writing by the Construction Representative, shall utilities be left disconnected at the end of a work day or over a weekend. Any interruption of utilities either intentionally or accidentally shall not relieve the Contractor responsible for the interruption from the responsibility to repair and restore the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.

J. Contractors shall limit operations and storage of materials to the area within the project, except as necessary to connect to existing utilities, and shall not encroach on neighboring property. The Contractor shall be responsible for repair of their damage to property on or off the project site occurring during construction of project. All such repairs shall be made to the satisfaction of the property owner.

K. Unless otherwise permitted, all materials shall be new and both workmanship and materials shall be of the best quality.

L. Unless otherwise provided and stipulated within these specifications, the Contractor shall furnish, construct, and/or install and pay for materials, devices, mechanisms, equipment, all necessary personnel, utilities including, but not limited to water, heat, light and electric power, transportation services, applicable taxes of every nature, and all other facilities necessary for the proper execution and completion of the work.

M. Contractor shall carefully examine the plans and drawings and shall be responsible for the proper fitting of his material, equipment and apparatus into the building.

N. The Contractor or subcontractors shall not overload, or permit others to overload, any part of any structure during the performance of this contract.

O. All temporary shoring, bracing, etc., required for the removal of existing work and/or for the installation of new work shall be included in this contract. The Contractor shall make good, at no cost to the Owner, any damage caused by improper support or failure of shoring in any respect. Each Contractor shall be responsible for shoring required to protect his work or adjacent property and improvements of Owner and shall be responsible for shoring or for giving written notice to adjacent property owners. Shoring shall be removed only after completion of permanent supports.

P. The Contractor shall provide at the proper time such material as is required for support of the work. If openings are required, whether shown on drawings or not, the Contractor shall see that they are properly constructed.

Q. During the performance of work the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences and other devices appropriately located on site which will give proper and understandable warning to all persons of danger of entry onto land, structure or equipment.

R. The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials.

S. The Contractor shall be responsible for care of the finished work and shall protect same from damage or defacement until substantial completion by the Owner. If the work is damaged by any cause, the Contractor shall immediately begin to make repairs in accordance with the drawings and specifications. Contractor shall be liable for all damage or loss unless attributable to the acts or omissions of the Owner or Designer. Any claim for reimbursement shall be submitted in accordance with Article 4. After substantial completion the Contractor will only be responsible for damage resulting from acts or omissions of the Contractor or subcontractors through final warranty.

T. In the event the Contractor encounters an unforeseen hazardous material, the Contractor shall immediately stop work in the area affected and report the condition to the Owner and Designer in writing. The Contractor shall not be required, pursuant to Article 4, to perform, any work relating to hazardous materials.

U. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation
or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 4.

V. Before commencing work, Contractors shall confer with the Construction Representative and facility representative and review any facility rules and regulations which may affect the conduct of the work.

W. Project signs will only be erected on major projects and only as described in the specifications. If no sign is specified, none shall be erected.

ARTICLE 3.7 -- SUBCONTRACTS
A. Subcontractor assignments as identified in the bid form shall not be changed without written approval of the Owner. The Owner will not approve changes of a listed subcontractor unless the Contractor documents, to the satisfaction of the Owner that the subcontractor cannot or will not perform the work as specified.

B. The Contractor is fully responsible to the Owner for the acts and omissions of all subcontractors and of persons either directly or indirectly employed by them.

C. Every subcontractor shall be bound by the applicable terms and provisions of these contract documents, but no contractual relationship shall exist between any subcontractor and the Owner unless the right of the Contractor to proceed with the work is suspended or this contract is terminated as herein provided, and the Owner in writing elects to assume the subcontract.

D. The Contractor shall upon receipt of "Notice to Proceed" and prior to submission of the first payment request, notify the Designer and Construction Representative in writing of the names of any subcontractors to be used in addition to those identified in the bid form and all major material suppliers proposed for all parts of the work.

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK
A. The Construction Representative, without giving notice to the surety and without invalidating this contract, may order extra work or make changes by altering, adding to or deducting from the work, this contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract. A claim for extension of time caused by any change must be adjusted at the time of ordering such change. No future request for time will be considered.

B. Each Contract Change shall include all costs required to perform the work including all labor, material, equipment, overheads and profit, delay, disruptions, or other miscellaneous expenses. No subsequent requests for additional compensation including claims for delay, disruption, or reduced efficiency as a result of each change will be considered. Values from the Schedule of Values will not be binding as a basis for additions to or deductions from the contract price.

C. The amount of any adjustment in this contract price for authorized changes shall be agreed upon before such changes become effective and shall be determined, through submission of a request for proposal, as follows:

1. By an acceptable fixed price proposal from the Contractor. Breakdown shall include all takeoff sheets of each Contractor and subcontractor. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

2. By a cost-plus-fixed-fee (time and material) basis with maximum price, total cost not to exceed said maximum. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

3. By unit prices contained in Contractor's original bid form and incorporated in the construction contract.

D. Overhead and Profit on Contract Changes shall be applied as follows:

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools, warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.

2. The percentages for overhead and profit charged on Contract Changes shall be negotiated, and may vary according to the nature, extent, and complexity of the work.
involved. However, the overhead and profit for the Contractor or subcontractor actually performing the work shall not exceed 14%. When one or more tiers of subcontractors are used, in no event shall any Contractor or subcontractor receive as overhead and profit more than 3% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty percent (20%) of the cost of materials, labor and equipment (exclusive of Contractor or any Subcontractor overhead and profit) necessary to put the contract change work in place.

3. The Contractor will be allowed to add the cost of bonding and insurance to their cost of work. This bonding and insurance cost shall not exceed 2% and shall be allowed on the total cost of the added work, including overhead and profit.

4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.

5. The percentage for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be negotiated, and may vary according to the nature, extent and complexity of the work involved, but in no case shall be less than ten percent (10%). If the percentage for overhead and profit charged for work added by Contract Changes for this contract has been negotiated to less than 10%, the negotiated rate shall then apply to credits as well.

E. No claim for an addition to this contract sum shall be valid unless authorized as aforesaid in writing by the Owner. In the event that none of the foregoing methods are agreed upon, the Owner may order the Contractor to perform work on a time and material basis. The cost of such work shall be determined by the Contractor's actual labor and material cost to perform the work plus overhead and profit as outlined herein. The Designer and Construction Representative shall approve the Contractor's daily time and material invoices for the work involved.

F. If the Contractor claims that any instructions involve extra cost under this contract, the Contractor shall give the Owner’s Representative written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the work. No such claim shall be valid unless so made and authorized by the Owner, in writing.

G. In an emergency affecting the safety of life or of the structure or of adjoining property, the Contractor, without special instruction or authorization from the Construction Representative, is hereby permitted to act at their discretion to prevent such threatened loss or injury. The Contractor shall submit a claim for compensation for such emergency work in writing to the Owner’s Representative.

**ARTICLE 4.2 – CHANGES IN COMPLETION TIME**

A. Extension of the number of work days stipulated in the Contract for completion of the work with compensation may be made when:

1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR

2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR

3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.

B. Extension of the number of work days stipulated in the Contract for completion of the work without compensation may be made when:

1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR

2. Labor strikes or acts of God occur, OR

3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.

C. No time extension or compensation will be provided for delays caused by or within the control of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.

D. The Contractor shall notify the Owner promptly of any occurrence or conditions which in the Contractor's opinion results in a need for an extension of time. The notice shall be in writing and shall include all necessary supporting materials with details of any resultant costs and be submitted in time to permit full investigation and
evaluation of the Contractor's claim. The Owner shall promptly acknowledge the Contractor's notice and, after recommendation from the Owner’s Representative and/or Designer, shall provide a decision to the Contractor. Failure on the part of the Contractor to provide such notice and to detail the costs shall constitute a waiver by the Contractor of any claim. Requests for extensions of time shall be for working days only.

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

A. Upon receipt of the "Intent to Award" letter, the Contractor must submit the following properly executed instruments to the Owner:

1. Contract;
2. Performance/payment bond as described in Article 6.1;
3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.

Above referenced items must be received by the Owner within ten (10) working days after the effective date of the contract. If not received, the Owner may treat the failure to timely submit them as a refusal by the Contractor to accept a contract for this work and may retain as liquidated damages the Contractor's bid bond, cashier's check or certified check as provided in the Instructions to Bidders. Upon receipt the Owner will issue a “Notice to Proceed” with the work to the Contractor.

B. Within the time frame noted in Section 013200 - Schedules, following receipt of the "Notice to Proceed", the Contractor shall submit to the Owner a progress schedule and schedule of values, showing activities through the end of the contract period. Should the Contractor not receive written notification from the Owner of the disapproval of the schedule of values within fifteen (15) working days, the Contractor may consider it approved for purpose of determining when the first monthly Application and Certification for Payment may be submitted.

C. The Contractor may commence work upon receipt of the Division of Facilities Management, Design and Construction’s "Notice to Proceed" letter. Contractor shall prosecute the work with faithfulness and energy, and shall complete the entire work on or before the completion time stated in the contract documents or pay to the Owner the damages resulting from the failure to timely complete the work as set out within Article 5.4.

ARTICLE 5.2 -- PROJECT CONSTRUCTION

A. Each Contractor shall submit for the Owner's approval, in reproducible form, a progress schedule showing the rate of progress and the order of the work proposed to carry on various phases of the project. The schedule shall be in conformance with the requirements outlined in Section 013200 – Schedules.

B. Contractor shall employ and supply a sufficient force of workers, material, and equipment and shall pay when due, any worker, subcontractor or supplier and otherwise prosecute the work with such diligence so as to maintain the rate of progress indicated on the progress schedule, prevent work stoppage, and insure completion of the project within the time specified.

ARTICLE 5.3 -- PROJECT COMPLETION

A. Substantial Completion. A Project is substantially complete when construction is essentially complete and work items remaining to be completed can be done without interfering with the Owner's ability to use the Project for its intended purpose.

1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:
   a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the “Contractor’s Punch.”
   b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.
   c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working days notice before the inspection shall be performed.

2. If the work is acceptable, the Owner shall issue a Certificate of Substantial Completion, which shall set forth the responsibilities of the Owner and the Contractor for utilities, security, maintenance, damage to the work and risk of loss. The Certificate shall also identify those remaining items of work to be
performed by the Contractor. All such work items shall be complete within 30 working days of the date of the Certificate, unless the Certificate specifies a different time. If the Contractor shall be required to perform tests that must be delayed due to climatic conditions, it is understood that such tests and affected equipment will be identified on the Certificate and shall be accomplished by the Contractor at the earliest possible date. Performance of the tests may not be required before Substantial Completion can be issued. The date of the issuance of the Certificate of Substantial Completion shall determine whether or not the work was completed within the contract time and whether or not Liquidated Damages are due.

3. If the work is not acceptable, and the Owner does not issue a Certificate of Substantial Completion, the Owner shall be entitled to charge the Contractor with the Designer’s and Owner’s costs of re-inspection, including time and travel.

B. Partial Occupancy. Contractor agrees that the Owner shall be permitted to occupy and use any completed or partially completed portions of the Project, when such occupancy and use is in the Owner’s best interest. Owner shall notify Contractor of its desire and intention to take Partial Occupancy as soon as possible but at least ten (10) working days before the Owner intends to occupy. If the Contractor believes that the portion of the work the Owner intends to occupy is not ready for occupancy, the Contractor shall notify the Owner immediately. The Designer shall inspect the work in accordance with the procedures above. If the Contractor claims increased cost of the project or delay in completion as a result of the occupancy, he shall notify the Owner immediately but in all cases before occupancy occurs.

C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor’s estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

D. Liquidated Damages. Contractor agrees that the Owner may deduct from the contract price and retain as liquidated damages, and not as penalty or forfeiture, the sum stipulated in this contract for each work day after the Contract Completion Day on which work is not Substantially Complete. Assessment of Liquidated Damages shall not relieve the Contractor or the surety of any responsibility or obligation under the Contract. In addition, the Owner may, without prejudice to any other rights, claims, or remedies the Owner may have including the right to Liquidated Damages, charge the Contractor for all additional expenses incurred by the Owner and/or Designer as the result of the extended contract period through Final Completion. Additional Expenses shall include but not be limited to the costs of additional inspections.

E. Early Completion. The Contractor has the right to finish the work before the contract completion date; however, the Owner assumes no liability for any hindrances to the Contractor unless Owner caused delays result in a time extension to the contract completion date. The Contractor shall not be entitled to any claims for lost efficiencies or for delay if a Certificate of Substantial Completion is given on or before the Contract Completion Date.

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner’s forms. No other pay request will be processed. Supporting breakdowns must be in the same format as Owner’s forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor’s request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make
payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:

1. Updated construction schedule
2. Certified payrolls consisting of name, occupation and craft, number of hours worked and actual wages paid for each individual employee, of the Contractor and all subcontractors working on the project

B. The Owner shall retain 5 percent of the amount of each such payment application, except as allowed by Article 5.4, until final completion and acceptance of all work covered by this contract.

C. Each payment made to Contractor shall be on account of the total amount payable to Contractor and all material and work covered by paid partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.

D. Materials delivered to the work site and not incorporated in the work will be allowed in the Application and Certification for Payment on the basis of one hundred (100%) percent of value, subject to the 5% retainage providing that they are suitably stored on the site or in an approved warehouse in accordance with the following requirements:

1. Material has previously been approved through submittal and acceptance of shop drawings conforming to requirements of Article 3.2 of General Conditions.
2. Delivery is made in accordance with the time frame on the approved schedule.
3. Materials, equipment, etc., are properly stored and protected from damage and deterioration and remain so - if not, previously approved amounts will be deleted from subsequent pay applications.
4. The payment request is accompanied by a breakdown identifying the material equipment, etc. in sufficient detail to establish quantity and value.

E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage, of major equipment and material stored off the site if all of the following conditions are met:

1. The request for consideration of payment for materials stored off site is made at least 15 working days prior to submittal of the Application for Payment including such material. Only materials inspected will be considered for inclusion on Application for Payment requests.
2. Materials stored in one location off site are valued in excess of $25,000.
3. That a Certificate of Insurance is provided indicating adequate protection from loss, theft conversion or damage for materials stored off site. This Certificate shall show the State of Missouri as an additional insured for this loss.
4. The materials are stored in a facility approved and inspected, by the Construction Representative.
5. Contractor shall be responsible for, Owner costs to inspect out of state facilities, and any delays in the completion of the work caused by damage to the material or for any other failure of the Contractor to have access to this material for the execution of the work.

F. The Owner shall determine the amount, quality and acceptability of the work and materials which are to be paid for under this contract. In the event any questions shall arise between the parties, relative to this contract or specifications, determination or decision of the Owner or the Construction Representative and the Designer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

G. Payments Withheld: The Owner may withhold or nullify in whole or part any certificate to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or items. The cost of corrective action(s) shall be borne by the Contractor.
2. A reasonable doubt that this contract can be completed for the unpaid balance.
3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.
4. Failure of the Contractor to update the construction schedule.
When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.

H. Final Payment: Upon receipt of written notice from the Contractor to the Designer and Project Representative that the work is ready for final inspection and acceptance, the Designer and Project Representative, with the Contractor, shall promptly make such inspection. If the work is acceptable and the contract fully performed, the Construction Representative shall complete a final acceptance report and the Contractor will be directed to submit a final Application and Certification for Payment. If the Owner approves the same, the entire balance shall be due and payable, with the exception of deductions as provided for under Article 5.4.

1. Where the specifications provide for the performance by the Contractor of certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall be considered as required under the provisions of the specifications, Section 013300 and this contract may be substantial. Full payment will not be made until the tests have been made and the equipment and system is finally accepted. If the tests are not completed when scheduled, the Owner may deduct 150% of the value of the tests from the final payment.

2. The final payment shall not become due until the Contractor delivers to the Construction Representative:
   a) A complete file of releases, on the standard form included in the contract documents as “Final Receipt of Payment and Release Form”, from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.
   b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor
   c) Certified copies of all payrolls
   d) As-built drawings

3. If any claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a claim including all costs and a reasonable attorney’s fee.

4. Missouri statute requires prompt payment from the Owner to the Contractor within thirty calendar days and from the Contractor to his subcontractors within fifteen calendar days. Failure to make payments within the required time frame entitles the receiving party to charge interest at the rate of one and one half percent per month calculated from the expiration of the statutory time period until paid.

5. The value of all unused unit price allowances and/or 150% of the value of the outstanding work items, and/or liquidated damages may be deducted from the final pay request without executing a Contract Change. Any unit price items which exceed the number of units in the contract may be added by Contract Change.

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

A. Contractor shall furnish a performance/payment bond in an amount equal to 100% of the contract price to guarantee faithful performance of the contract and 100% of the contract price to guarantee the payment of all persons performing labor on the project and furnishing materials in connection therewith under this contract as set forth in the standard form of performance and payment bond included in the contract documents. The surety on such bond shall be issued by a surety company authorized by the Missouri Department of Insurance to do business in the state of Missouri.

B. All Performance/Payment Bonds furnished in response to this provision shall be provided by a bonding company with a rating of B+ or higher as established by A.M. Best Company, Inc. in their most recent publication.

ARTICLE 6.2 -- INSURANCE

A. The successful Contractor shall procure and maintain for the duration of the contract issued a policy or policies of insurance for the protection of both the Contractor and the Owner and their respective officers, officials, agents, consultants and employees. The Owner requires certification of insurance coverage from the Contractor prior to commencing work.

B. Minimum Scope and Extent of Coverage
1. General Liability

Commercial General Liability, ISO coverage form number or equivalent CG 00 01 ("occurrence" basis), or I-SO coverage form number CG 00 02, or ISO equivalent.

If ISO equivalent or manuscript general liability coverage forms are used, minimum coverage will be as follows:
Premises/Operations; Independent Contractors; Products/Completed Operations; personal Injury; Broad Form Property Damage including Completed Operations; Broad Form Contractual Liability Coverage to include Contractor's obligations under Article 1.11 Indemnification and any other Special Hazards required by the work of the contract.

2. Automobile Liability

Business Automobile Liability Insurance, ISO Coverage form number or equivalent CA 00 01 covering automobile liability, code 1 "ANY AUTO".

3. Workers' Compensation and Employer's Liability

Statutory Workers' Compensation Insurance for Missouri and standard Employer's Liability Insurance, or the authorization to self-insure for such liability from the Missouri Division of Workers' Compensation.

4. Builder's Risk or Installation Floater Insurance

Insurance upon the work and all materials, equipment, supplies, temporary structures and similar items which may be incident to the performance of the work and located at or adjacent to the site, against loss or damage from fire and such other casualties as are included in extended coverage in broad "All Risk" form, including coverage for Flood and Earthquake, in an amount not less than the replacement cost of the work or this contract price, whichever is greater, with loss payable to Contractor and Owner as their respective interests may appear.

Contractor shall maintain sufficient insurance to cover the full value of the work and materials as the work progresses, and shall furnish Owner copies of all endorsements. If Builder's Risk Reporting- Form of Endorsement is used, Contractor shall make all reports as required therein so as to keep in force an amount of insurance which will equal the replacement cost of the work, materials, equipment, supplies, temporary structures, and other property covered thereby; and if, as a result of Contractor's failure to make any such report, the amount of insurance so recoverable shall be less than such replacement cost, Contractor's interest in the proceeds of such insurance, if any, shall be subordinated to Owner's interest to the end that Owner may receive full reimbursement for its loss.

C. Minimum Limits of Insurance

1. General Liability

   Contractor
   $2,000,000 combined single limit per occurrence for bodily injury, personal injury, and property damage
   $2,000,000 annual aggregate

2. Automobile Liability

   $2,000,000 combined single limit per occurrence for bodily injury and property damage

3. Workers' Compensation and Employers Liability

   Workers' Compensation limits as required by applicable State Statutes (generally unlimited) and minimum of $1,000,000 limit per accident for Employer's Liability.

   General Liability and Automobile Liability insurance may be arranged under individual policies for the full limits required or by a combination of underlying policies with the balance provided by a form-following Excess or Umbrella Liability policy.

D. Deductibles and Self-Insured Retentions

All deductibles, co-payment clauses, and self-insured retentions must be declared to and approved by the Owner. The Owner reserves the right to request the reduction or elimination of unacceptable deductibles or self-insured retentions, as they would apply to the Owner, and their respective officers, officials, agents, consultants and employees. Alternatively, the Owner may request Contractor to procure a bond guaranteeing payment of losses and related investigations, claims administration, and defense expenses.

E. Other Insurance Provisions and Requirements

The respective insurance policies and coverage, as specified below, must contain, or be endorsed to contain the following conditions or provisions:

1. General Liability

   The Owner, and its respective commissioners, officers, officials, agents, consultants and employees shall be endorsed as additional insured’s by ISO form CG 20 26 Additional
Insured - Designated Person or Organization. As additional insured’s, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor’s activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured’s. Insurance of self-insurance programs maintained by the designated additional -insured’s shall be excess of the Contractor’s insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's general liability insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner or for any of its officers, officials, agents, consultants or employees.

3. Workers’ Compensation/Employer’s Liability

Contractor's workers' compensation insurance shall be endorsed with NCCI form WC 00 03 01 A - Alternative Employer Endorsement. The Alternative Employer Endorsement shall designate the Owner as "alternate employers."

4. All Coverages

Each insurance policy required by this section of the Contract shall contain a stipulation, endorsed if necessary, that the Owner will receive a minimum of a thirty (30) calendar day advance notice of any policy cancellation. Ten (10) calendar days advance notice is required for policy cancellation due to non-payment of premium.

F. Insurer Qualifications and Acceptability

Insurance required hereunder shall be issued by an A.M. Best, “B+” rated, Class IX insurance company approved to conduct insurance business in the state of Missouri.

G. Verification of Insurance Coverage

Prior to Owner issuing a Notice to Proceed, the Contractor shall furnish the Owner with Certificate(s) of Insurance and with any applicable original endorsements evidencing the required insurance coverage. The insurance certificates and endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements received by the Owner are subject to review and approval by the Owner. The Owner reserves the right to require certified copies of all required policies at any time. If the scope of this contract will exceed one (1) year - or, if any of Contractor's applicable insurance coverage expires prior to completion of the work or services required under this contract - the Contractor will provide a renewal or replacement certificate before continuing work or services hereunder. If the Contractor fails to provide documentation of required insurance coverage, the Owner may issue a stop work order and no additional contract completion time and/or compensation shall be granted as a result thereof.
ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

A. When conditions at the site of the proposed work are considered by the Owner to be unsatisfactory for prosecution of the work, the Contractor may be ordered in writing to suspend the work or any part thereof until reasonable conditions exist. When such suspension is not due to fault or negligence of the Contractor, time allowed for completion of such suspended work will be extended by a period of time equal to that lost due to delay occasioned by ordered suspension. This will be a no cost time extension.

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

1. If the Contractor shall file for bankruptcy, or should make a general assignment for the benefit of the creditors, or if a receiver should be appointed on account of insolvency, or if the contractor should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials, or if the contractor should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Owner, or otherwise be guilty of a substantial violation of any provision of this contract, then the Owner may serve notice on the Contractor and the surety setting forth the violations and demanding compliance with this contract. Unless within ten (10) consecutive calendar days after serving such notice, such violations shall cease and satisfactory arrangements for correction be made, the Owner may suspend the Contractor's right to proceed with the work or terminate this contract.

2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive calendar days after demand therefore, the Owner may take over the work and prosecute the same to completion by bid or negotiated contract, or the Owner may elect to take possession of and utilize in completing the work such materials, supplies, appliances and plant as may be on the site of the work, and all subcontractors, if the Owner elects, shall be bound to perform their contracts.

B. The Contractor and its surety shall be and remain liable to the Owner for any excess cost or damages occasioned to the Owner as a result of the actions above set forth.

C. The Contractor in the event of such suspension or termination shall not be entitled to receive any further payments under this contract until the work is wholly finished. Then if the unpaid balance under this contract shall exceed all expenses of the Owner as certified by the Director, such excess shall be paid to the Contractor; but, if such expenses shall exceed the unpaid balance as certified by the Director, the Contractor and their surety shall be liable for and shall pay the difference and any damages to the Owner.

D. In exercising Owner's right to secure completion of the work under any of the provisions hereof, the Director shall have the right to exercise Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the work.

E. The rights of the Owner to suspend or terminate as herein provided shall be cumulative and not exclusive and shall be in addition to any other remedy provided by law.

F. The Contractor in the event of such suspension or termination may be declared ineligible for Owner contracts for a minimal period of twelve (12) months. Further, no contract will be awarded to any Contractor who lists in their bid form any subcontractor whose prior performance has contributed, as determined by the Owner, to a breach of a contract. In order to be considered for state-awarded contracts after this period, the Contractor/subcontractor will be required to forward acceptance reports to the Owner regarding successful completion of non-state projects during the intervening twelve (12) months from the date of default. No contracts will be awarded to a subcontractor/Contractor until the ability to perform responsibly in the private sector has been proven to the Owner.

ARTICLE 7.3 -- FOR CONVENIENCE

A. The Owner may terminate or suspend the Contract or any portion of the Work without cause at any time, and at the Owner's convenience. Notification of a termination or suspension shall be in writing and shall be given to the Contractor and their surety. If the Contract is suspended, the notice will contain the anticipated duration of the suspension or the conditions under which work will be permitted to resume. If appropriate, the Contractor will be requested to demobilize and re-mobilize and will be reimbursed time and costs associated with the suspension.

B. Upon receipt of notification, the Contractor shall:
1. Cease operations when directed.

2. Take actions to protect the work and any stored materials.

3. Place no further subcontracts or orders for material, supplies, services or facilities except as may be necessary to complete the portion of the Contract that has not been terminated. No claim for payment of materials or supplies ordered after the termination date shall be considered.

4. Terminate all existing subcontracts, rentals, material, and equipment orders.

5. Settle all outstanding liabilities arising from termination with subcontractors and suppliers.

6. Transfer title and deliver to the Owner, work in progress, completed work, supplies and other material produced or acquire for the work terminated, and completed or partially completed plans, drawings information and other property that, if the Contract had been completed, would be required to be furnished to the Owner.

C. For termination without cause and at the Owner's convenience, in addition to payment for work completed prior to date of termination, the Contractor may be entitled to payment of other documented costs directly associated with the early termination of the contract. Payment for anticipated profit and unapplied overhead will not be allowed.
SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:
   A. These Supplementary General Conditions clarify, add, delete, or otherwise modify standard terms and conditions of DIVISION 0, BIDDING AND CONTRACTING REQUIREMENTS.

2.0 CONTACTS:
   Designer: Nicholas Bruner  
   Farnsworth Group, Inc.  
   20 Allen Ave., Suite 200  
   St. Louis, MO  63119  
   Telephone:  618-236-2000; Fax:  314-962-1253  
   Email: nbruner@F-W.com

   Construction Representative: Cody Waters, OA/FMDC  
   Parkview State School, 1020 South Pkwy, Cape Girardeau, MO  63703  
   Telephone:  573-301-3431  
   Email: cody.waters@oa.mo.gov

   Project Manager: Sandra Walther  
   Division of Facilities Management, Design and Construction  
   301 West High Street, Room 730  
   Jefferson City, Missouri  65102  
   Telephone:  573-751-2283; Fax:  573-751-7277  
   Email: Sandra.Walther@oa.mo.gov

   Contract Specialist: Kelly Copeland  
   Division of Facilities Management, Design and Construction  
   301 West High Street, Room 730  
   Jefferson City, Missouri  65102  
   Telephone:  573-522-2283; Fax:  573-751-7277  
   Email: Kelly.Copeland@oa.mo.gov

3.0 NOTICE: ALL BID MATERIALS ARE DUE AT THE TIME OF BID SUBMITTAL. THERE IS NO SECOND SUBMITTAL FOR THIS PROJECT.

4.0 FURNISHING CONSTRUCTION DOCUMENTS:
   A. The Owner will furnish the Contractor with approximately 10 complete sets of drawings and specifications at no charge.
   B. The Owner will furnish the Contractor with approximately 10 sets of explanatory or change drawings at no charge.
   C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

5.0 ILLEGAL IMMIGRATION REFORM AND IMMIGRANT RESPONSIBILITY ACT
   The Contractor understands and agrees that by signing a contract for this project, they certify the following:
   A. The Contractor shall only utilize personnel authorized to work in the United States in accordance with applicable federal and state laws. This includes but is not limited to the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) and INA Section 274A.
   B. If the Contractor is found to be in violation of this requirement or the applicable laws of the state, federal and local laws and regulations, and if the State of Missouri has reasonable cause to believe that the Contractor has knowingly employed individuals who are not eligible to work in the United States, the state shall have the right to cancel the contract immediately without penalty or recourse and suspend or debar the contractor from doing business with the state.
   C. The Contractor agrees to fully cooperate with any audit or investigation from federal, state or local law enforcement agencies.

6.0 SAFETY REQUIREMENTS
   Contractor and subcontractors at any tier shall comply with RSMo 292.675 and Article 1.3, E, of Section 007213, General Conditions.
"General Decision Number: MO20190006 10/25/2019

Superseded General Decision Number: MO20180006

State: Missouri

Construction Type: Building

County: Cape Girardeau County in Missouri.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available.
Modification Number | Publication Date  
---------------------|------------------
 0                   | 01/04/2019       
 1                   | 01/18/2019       
 2                   | 03/08/2019       
 3                   | 04/12/2019       
 4                   | 05/24/2019       
 5                   | 07/05/2019       
 6                   | 07/12/2019       
 7                   | 09/20/2019       
 8                   | 09/27/2019       
 9                   | 10/04/2019       
 10                  | 10/25/2019       

ASBESTOS WORKER/HEAT & FROST

INSULATOR................... $ 38.70  23.17

BRICKLAYER.................. $ 30.60  12.75

TILE SETTER............... $ 30.60  12.75

CARPENTER (Including Formwork)... $ 27.80  17.77

https://beta.sam.gov/wage-determination/_MO20190006/10/document
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  a. VACATION: Employer contributes 8% of basic hourly rate as vacation pay credit for more than 5 years of service; and 6% for 6 months to 5 years of service.


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<td>Bulldozer $30.31</td>
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<tr>
<td>Loader $30.31</td>
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<tr>
<td>Paver $30.31</td>
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<tr>
<td>Roller $30.31</td>
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* IRON8782-008 05/01/2019
IRONWORKER, REINFORCING AND STRUCTURAL.......................... $ 27.38  23.29

LABORER

Brick Mason Tender.......... $ 26.03  13.12
Common or General & Landscape................. $ 24.71  13.12

PLUMBER, Excludes HVAC Pipe

Installation

Mechanical Contracts including all piping and temperature control work $7.0 million & under.......... $ 40.41  21.49
Mechanical Contracts including all piping and temperature control work over $7.0 million........... $ 41.85  27.85
including all piping and temperature control work

over $7.0 million ........... $ 41.85 27.85

---------------------------------------------------------------------------------------------------------
       ROOF0002-011 06/01/2019

Rates Fringes

ROOFER.......................... $ 24.50 12.28

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       SFM08669-003 04/01/2019

Rates Fringes

SPRINKLER FITTER (Fire Sprinklers)....................... $ 36.81 22.22

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       SHEEO036-017 08/01/2018

Rates Fringes

SHEET METAL WORKER, Includes
HVAC Duct and Unit
Installation....................... $ 42.65 22.72

---------------------------------------------------------------------------------------------------------
       SUMO2010-005 03/08/2010

Rates Fringes

OPERATOR: Grader/Blade........... $ 22.80 10.78

PAINTER: Brush Only.............. $ 16.44 6.01

PAINTER: Roller.................... $ 16.44 6.01

PAINTER: Spray.................... $ 18.79 8.12

TRUCK DRIVER: Dump Truck....... $ 25.57 0.00

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WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers
A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers
Classification(s) listed under the UAWG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAWG-OH-0010
08/29/2014. UAWG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAWG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

https://beta.sam.gov/wage-determination/020190006/10/document
2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION"
SECTION 011000 – SUMMARY OF WORK

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 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of Interior renovations and various building additions.

1. Project Location: Missouri Veterans Home, 2400 Veterans Memorial Dr., Cape Girardeau, MO  63701

2. Owner: State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri  65102.

B. Contract Documents dated 07-24-19 were prepared for the Project by Farnsworth Group, 20 Allen Avenue, Suite 200, St. Louis, MO  63119.

C. The Work consists of renovations to various areas of the Cape Girardeau Veterans Home.


D. The Work will be constructed under a single prime contract.

1.3 DESIGNER’S ESTIMATE OF CONSTRUCTION COSTS

A. The project designer has prepared this cost estimate. The State of Missouri makes no guarantee regarding the accuracy of the values contained herein nor does the State of Missouri intend to imply that the values associated are accurate or in any way reflect actual costs required to perform the work represented by the specifications and drawings. The contractor should not rely on this estimate in any way while preparing a bid for this project or otherwise.

B. Project Cost Estimate Range: $6,800,000.00 - $9,500,000.00

1.4 WORK UNDER OTHER CONTRACTS

A. Separate Contract: The Owner has awarded a separate contract for performance of certain construction operations at the site. The separate contract includes the following:
1. **Contract:** A separate contract will be awarded for **U1802-01 Cape Girardeau Vets Home-Replace Pavement & Upgrade Exterior Lighting.** Work includes removing asphalt parking lot pavement and replacing it with concrete pavement, removal and replacement of curb & gutter, sidewalks. Existing exterior parking lot lights and wall packs on buildings will be replaced with LED fixtures.

B. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

### 1.5 WORK SEQUENCE

A. The Work will be conducted in **11** phases. Refer to drawing G-004 for Phasing Plan.

B. The following phasing schedule is the preliminary phasing schedule. Contractor to provide detailed schedule as described in Section 01 3200

C. Phases Core 1 and Core 2 will run subsequently. Phases A1, A2, A3, B1, B2, B3, C1, C2, C3 will run subsequently. Core Phases (Core 1 and Core 2) will run concurrently with the Resident room phases (A1, A2, A3, B1, B2, B3, C1, C2, C3).

1. **Phase Core 1:** Expansion of the entry, main dining room, employee break room, lobby and offices, and the renovation of the existing lobby, canteen, core hallways, smoke room and activity room. Work of this phase shall be substantially complete, ready for occupancy within 140 calendar days of commencement of construction.

   a. Contractor to minimize room/area closures in Core 1 phase. Intermediate occupancy of specific spaces to be decided with contractor upon awarded bid.

2. **Phase Core 2:** Renovation of the existing office suite. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

3. **Phase C3:** Renovation of resident rooms and commons in C300 wing. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

4. **Phase C2:** Renovation of resident rooms and commons in C200 wing along with the addition of a storage room. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

5. **Phase C1:** Renovation of resident rooms and commons in C100 wing. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

6. **Phase B3:** Renovation of resident rooms and commons in B300 wing. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

7. **Phase B2:** Renovation of resident rooms and commons in B200 wing along with the addition of a storage room. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.
8. Phase B1: Renovation of resident rooms and commons in B100 wing. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

9. Phase A3: Renovation of resident rooms and commons in A300 wing. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

10. Phase A2: Renovation of resident rooms and commons in A200 wing along with the addition of a storage room, new dining room, and resident rooms. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

11. Phase A1: Renovation of resident rooms and commons in A100 wing along with renovation of the existing Wing A dining room and kitchenette. Work of this phase shall be substantially complete, ready for occupancy within 42 calendar days of commencement of construction.

D. Resident Room Phases (A1, A2, A3, B1, B2, B3, C1, C2, C3) duration to include 14 calendar days between Phases to allow for the move-in and move-out of the residents by the Cape Girardeau Veteran’s Home staff.

E. Resident Room Phase Order: C3, C2, C1, B3, B2, B1, A3, A2, A1

1.6 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor’s use of the premises limited only by the Owner’s right to perform work or to retain other contractors on portions of the Project.

B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.

2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

3. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

4. Maintain 42” clear hallways at all times.

1.7 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to
minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner’s operations.

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. The Designer will prepare a Certificate of Partial Occupancy for each specific portion of the Work to be occupied prior to substantial completion.

2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions for the building.

3. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions for the building.

1.8 OWNER-FURNISHED PRODUCTS

A. The Owner will furnish one hundred ten (110) window blinds, one hundred ten (110) TV mounting brackets, one hundred ten (110) cubical curtains, five (5) decorative lighting bollards and one (1) ice cream machine. The Work includes providing support systems to receive Owner’s equipment, and mechanical and electrical connections, and installation of Owner’s supplied equipment.

1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Contractor.

2. The Owner will arrange and pay for delivery of Owner-furnished items according to the contractor’s Construction Schedule.

3. The Contractor is responsible for receiving, unloading and handling Owner furnished items at the site.

4. Following delivery, the Contractor will inspect items delivered for damage. The Contractor shall not accept damaged items and shall notify the Owner of rejection of damaged items.

5. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.

6. The Owner will arrange for manufacturer’s field services and for the delivery of manufacturer’s warranties to the appropriate Contractor.

7. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor’s Construction Schedule.

8. The Contractor shall review shop drawings, product data and samples and return them to the Designer noting discrepancies or problems anticipated in use of the project.

9. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his operations.
1.9 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

END OF SECTION 011000
SECTION 012100 – ALLOWANCES

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 items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Contract Change.

B. Types of allowances include the following:

1. Weather allowances.
2. Facility Interruption Allowance.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Contract Changes for allowances.
2. Division 1 Section "Unit Prices" for procedures for using unit prices.

1.3 WEATHER ALLOWANCE

A. Included within the completion period for this project are a specified number of “bad weather” days (see Schedule of Allowances).

B. The Contractor’s progress schedule shall clearly indicate the bad weather day allowance as an “activity” or “activities”. In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor’s scheduled workday, that day shall be declared unavailable for work due to weather (a “bad weather” day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor’s current progress schedule.

C. The Contractor’s Representative and the Construction Representative shall agree monthly on the number of “bad weather” days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the “bad weather” days for a particular month, that disagreement shall be noted on this written document and signed by each party’s representative. Failure of the Contractor’s representative to sign the “bad weather” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “bad weather” day determination contained in that document.
D. There will be no modification to the time of contract performance due solely to the failure to deplete the “bad weather” day allowance.

E. Once this allowance is depleted, a no cost Contract Change time extension will be executed for “bad weather” days, as defined above, encountered during the remainder of the Project.

1.4 FACILITY INTERRUPTION ALLOWANCE

A. Included within the completion period for this project are facility interruption days (see Schedule of Allowances).

B. The Contractor's progress schedule shall clearly indicate the facility interruption day allowance as an "activity" or "activities". In the event facility interruptions preclude performance of critical work activities for 50% or more of the Contractor's scheduled workday, that day shall be declared unavailable for work due to facility interruption and charged against the above allowance. Critical work activities will be determined by review of the Contractor's current progress schedule.

C. The Contractor's Representative and the Construction Representative shall agree monthly on the number of "facility interruption" days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the "facility interruption" days for a particular month, that disagreement shall be noted on this written document and signed by each party's representative. Failure of the Contractor's representative to sign the "facility interruption" day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the "facility interruption" day determination contained in that document.

D. There will be no modification to the time of contract performance due solely to the failure to deplete the "facility interruption" day allowance. The substantial completion date will not change.

1.5 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, Designer 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 Designer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Designer from the designated supplier.

1.6 SUBMITTALS

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

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 COORDINATION

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. Weather Allowance: Included within the completion period for this Project (10) ten “bad weather” days.

B. Provide (7) Seven Facility Interruption days.

END OF SECTION 012100
SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost for each alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

B. No additional time will be allowed for alternate work unless the number of workdays is so stated on the bid form.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate the Alternate Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Notification: The award of the Contract will indicate whether alternates have been accepted or rejected.

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

D. Schedule: A “Schedule of Alternates” is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.
PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Add a pre-engineered timber framed pavilion on 42-foot x 59-foot concrete slab at the south side of the site. Pavilion to include manufactured metal casework, two single hole restrooms with concrete masonry unit walls and stone veneer. Refer to Specification SECTION 06 1323 - HEAVY TIMBER FRAMING and Drawing Sheet A-117.

B. Alternate No. 2: Add a new ornamental metal security fence at the south side of the site as indicated on the civil drawings. Refer to Specification SECTION 32 3119 - DECORATIVE METAL FENCES AND GATES and Drawing Sheet C-007

C. Alternate No. 3: Add (5) building additions with (2) restrooms each and semi-private sleeping room. Building additions as follows and as indicated on Drawing Sheets A-110, A-111, A-112 and A-118:
   1. Wing A (1) building addition.
   2. Wing B (2) building additions.
   3. Wing C (2) building additions.

END OF SECTION 012300
SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

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 handling and processing Contract Modifications.

B. Related Sections include the following:
   1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
   2. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
   3. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Contract Change requirements.

1.3 REQUESTS FOR INFORMATION

A. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a “Request for Information” (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.

C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Contract Change for the work. Failure to give such
written notice within ten (10) working days, shall waive the Contractor’s right to seek additional time or cost under Article 4, “Changes in the Work” of the General Conditions.

1.4 MINOR CHANGES IN THE WORK

A. Designer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Amount or the Contract Time, on ”Designer’s Supplemental Instructions” (DSI).

1.5 PROPOSAL REQUESTS

A. The Designer or Owner Representative will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued using the “Request for Proposal” (RFP) form. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Contract Change Detailed Breakdown form. Subcontractors may use the appropriate Contract Change Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:
   a. A detailed breakdown of costs per Article 4.1 of the General Conditions.
   b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

1.6 CONTRACT CHANGE PROCEDURES

A. On Owner's approval of a Proposal Request, the Designer or Owner Representative will issue a Contract Change for signatures of Owner and Contractor on the “Contract Change” form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REFERENCED FORMS

A. The following forms can be found on our website at https://oa.mo.gov/facilities/vendor-links/architectengineering-forms or https://oa.mo.gov/facilities/vendor-links/contractor-forms:

1. Request for Information
2. Designer’s Supplemental Instructions
3. Request for Proposal
4. Contract Change
5. Contract Change Detailed Breakdown – SAMPLES
6. Contract Change Detailed Breakdown – General Contractor (GC)
7. Contract Change Detailed Breakdown – Subcontractor (SUB)

END OF SECTION 012600
SECTION 013100 – 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 provisions for coordinating construction operations on Projects including, but not limited to, the following:
   1. Coordination Drawings.
   2. Administrative and supervisory personnel.
   3. Project meetings.

B. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Contractor.

C. Related Sections include the following:
   1. Division 1, Section 013200 "Schedules" for preparing and submitting Contractor's Construction Schedule.
   3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections, which depend on each other for proper installation, connection, and operation.

B. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components including mechanical and electrical.

C. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project Closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

B. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
1.5 PROJECT MEETINGS

A. The Owner’s Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.

1. Minutes: Designer will record and distribute meeting minutes.

B. Progress Meetings: The Owner’s Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 “General Conditions”.

1. Minutes: Designer will record and distribute to Contractor the meeting minutes.

C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:
   a. Contract Documents
   b. Options
   c. Related RFIs
   d. Related Contract Changes
   e. Purchases
   f. Deliveries
   g. Submittals
   h. Review of mockups
   i. Possible conflicts
   j. Compatibility problems
   k. Time schedules
   l. Weather limitations
   m. Manufacturer's written recommendations
   n. Warranty requirements
   o. Compatibility of materials
p. Acceptability of substrates
q. Temporary facilities and controls
r. Space and access limitations
s. Regulations of authorities having jurisdiction
t. Testing and inspecting requirements
u. Installation procedures
v. Coordination with other Work
w. Required performance results
x. Protection of adjacent Work
y. Protection of construction and personnel

3. Contractor shall record significant conference discussions, agreements, and disagreements including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

6. Revise paragraph below if Project requires holding progress meetings at different intervals. Insert special intervals such as "every third Tuesday" to suit special circumstances.

7. Project name
8. Name and address of Contractor
9. Name and address of Designer
10. RFI number including RFIs that were dropped and not submitted
11. RFI description
12. Date the RFI was submitted
13. Date Designer's response was received
14. Identification of related DSI or Proposal Request, as appropriate

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for a Bar Chart Schedule for the project construction activities, schedule of submittals, and schedule for testing.

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

A. The Contractor shall submit to the Designer, within ten (10) working days following the Notice to Proceed, a Progress Schedule showing the rate of progress the Contractor agrees to maintain and the order in which he proposed to carry out the various phases of Work. No payments shall be made to the Contractor until the Progress Schedule has been approved by the Owner.

B. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date. Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.

C. The Contractor shall submit Progress Schedules to Subcontractors to permit coordinating their Progress Schedules to the general construction Work. The Contractor shall coordinate preparation and processing of Schedules and reports with performance of other construction activities.

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

A. Bar-Chart Schedule: The Contractor shall prepare a comprehensive, fully developed, horizontal bar chart-type Contractor’s Construction Schedule. The Contractor for general construction shall prepare the Construction Schedule for the entire Project. The Schedule shall show the percentage of work to be completed at any time, anticipated monthly payments by Owner, as well as significant dates (such as completion of excavation, concrete foundation work, underground lines, superstructure, rough-ins, enclosure, hanging of fixtures, etc.) which shall serve as check points to determine compliance with the approved Schedule. The Schedule shall also include an activity for the number of “bad” weather days specified in Section 012100 – Allowances.
1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.
   
a. If practical, use the same Schedule of Values breakdown for schedule time bars.

2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.

3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall 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 required schedules and reports.

6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:

1. Requirement for Phased completion
2. Work by separate Contractors
3. Work by the Owner
4. Pre-purchased materials
5. Coordination with existing construction
6. Limitations of continued occupancies
7. Un-interruptible services
8. Partial Occupancy prior to Substantial Completion
9. Site restrictions
10. Provisions for future construction
11. Seasonal variations
12. Environmental control

C. Work Stages: Use crosshatched bars to indicate important stages of construction for each major portion of the Work. Such stages include, but are not necessarily limited to, the following:

1. Subcontract awards
2. Submittals
3. Purchases
4. Mockups
5. Fabrication
6. Sample testing
7. Deliveries
8. Installation
9. Testing
10. Adjusting
11. Curing
12. Startup and placement into final use and operation

D. Area Separations: Provide a separate time bar to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a “major area” is a story of construction, a separate building, or a similar significant construction element.

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

3.3 SCHEDULE OF SUBMITTALS

A. Upon acceptance of the Construction Progress Schedule, prepare and submit a complete schedule of submittals. Coordinate the submittal schedule with Section 011300 SUBMITTALS, the approved Construction Progress Schedule, list of subcontracts, Schedule of Values and the list of products.

B. Prepare the schedule in chronological order. Provide the following information

1. Scheduled date for the first submittal
2. Related Section number
3. Submittal category
4. Name of the Subcontractor
5. Description of the part of the Work covered
6. Scheduled date for resubmittal
7. Scheduled date for the Designer’s final release or approval
C. Distribution: Following the Designer’s response to the initial submittal schedule, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with submittal dates indicated.
   1. Post copies in the Project meeting room and temporary field office.
   2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

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

3.4 SCHEDULE OF INSPECTIONS AND TESTS

A. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule with (15) days of the date established for commencement of the Contract Work. The Contractor is to notify the testing agency at least (5) working days in advance of the required tests unless otherwise specified.

B. Form: This schedule shall be in tabular form and shall include, but not be limited to, the following:
   1. Specification Section number
   2. Description of the test
   3. Identification of applicable standards
   4. Identification of test methods
   5. Number of tests required
   6. Time schedule or time span for tests
   7. Entity responsible for performing tests
   8. Requirements for taking samples
   9. Unique characteristics of each service

C. Distribution: Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

END OF SECTION 013200
SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, 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. Shop Drawings
   2. Product Data
   3. Samples
   4. Quality Assurance Submittals
   5. Construction Photographs
   6. Operating and Maintenance Manuals
   7. Warranties

B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
   1. Construction Progress Schedule including Schedule of Values
   2. Performance and Payment Bonds
   3. Insurance Certificates
   4. Applications for Payment
   5. Certified Payroll Reports
   6. Partial and Final Receipt of Payment and Release Forms
   7. Affidavit – Compliance with Prevailing Wage Law
   8. Record Drawings
   9. Notifications, Permits, etc.

C. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an Item or Work including erection and setting instructions and integration with the Work of other trades.

D. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.
1.3 SUBMITTAL PROCEDURES

A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. 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.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

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

B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:

   1. Date of Submission
   2. Name of Project
   3. Location
   4. Section Number of Specification
   5. State Project Number
   6. Name of Submitting Contractor
   7. Name of Subcontractor
   8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

A. Comply with the General Conditions, Article 3.2.

B. The Contractor shall 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.

C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including 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 8½”x11” but no larger than 36”x48”.

1.5 PRODUCT DATA

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall 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. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:
   a. Manufacturer’s printed recommendations
   b. Compliance with Trade Association standards
   c. Compliance with recognized Testing Agency standards
   d. Application of Testing Agency labels and seals
   e. Notation of dimensions verified by field measurement
   f. Notation of coordination requirements

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

1.6 SAMPLES

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer’s sample including the following:
   a. Specification Section number and reference
   b. Generic description of the Sample
   c. Sample source
   d. Product name or name of the Manufacturer
   e. Compliance with recognized standards
   f. Availability and delivery time
2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

   a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.

   b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

   c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

   d. Samples not incorporated into the Work, or otherwise designated as the Owner’s property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Field samples are full-size examples erected onsite to illustrate finishes, coatings, or finish materials and to establish the Project standard.

   a. The Contractor shall comply with submittal requirements to the fullest extent possible. The Contractor shall process transmittal forms to provide a record of activity.

1.7 QUALITY ASSURANCE DOCUMENTS

A. The Contractor shall comply with the General Conditions, Article 3.2

B. The Contractor shall 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.

C. 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.

   1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.

D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.

E. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.

   1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.
2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.

3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.

4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

A. The Contractor shall submit all required manufacturer’s operating instructions, maintenance/service manuals, and warranties in accordance with the General Conditions, Article 3.5, and Supplementary Conditions along with this and other Sections of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

A. Contractor shall submit the following information for materials and equipment to be provided under this contract.

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END OF SECTION 013300
SECTION 013513.28 – SITE SECURITY AND HEALTH REQUIREMENTS (Veterans)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. List of required submittals:
   1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.
   2. Schedule of proposed shutdowns, if applicable.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE

A. The Contractor shall arrange with the Construction Representative and appropriate Facility Representatives for the controlled entry of construction personnel, materials, and equipment into the work areas.

B. The Contractor shall establish regular working hours with the Construction Representative and the Facility. Working hour changes or overtime are to be reported and approved (48) hours ahead of time. Emergency overtime is to be reported as soon as it is evident that overtime is needed.

C. The Contractor shall provide the name and phone number of the individual(s) who is in charge onsite and who can be contacted in case of an emergency. This individual(s) must be able to furnish names and addresses of all construction personnel upon request.

D. All construction personnel shall be identified to the Facility Representative and, when the Facility Representative feels it is necessary, they will be issued identification cards.

3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

A. The Contractor shall be responsible and take all necessary precautions to guard against and eliminate possible fire hazards. Onsite burning is prohibited.

B. Store all flammable or hazardous materials in proper container located outside the buildings or offsite, if possible.

C. Provide and maintain in good order, during construction, all fire extinguishers as required by the National Fire Protection Association. In areas of flammable liquids, asphalt, or electrical hazards, extinguishers of the 15-pound carbon dioxide type or 20-pound dry chemical type shall be provided.

D. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times unless written approval is received from the Construction Representative and the appropriate Facility Representative at least (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.
E. Conduct operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent facilities. Do not obstruct streets or walks or use facilities without permission from the Facility.

F. Construction personnel shall not exceed the Facility speed limit of 15mph unless posted otherwise.

G. Take all necessary reasonable measures to reduce air and water pollution by any material or equipment use during construction. Keep volatile wastes in covered containers. Do not dispose of volatile wastes or oils in storm or sanitary drains.

H. Keep project neat, orderly, and in a safe condition at all times. Immediately remove all hazardous waste. Do not allow rubbish to accumulate. Provide onsite containers for collection of rubbish and dispose of it at frequent intervals during progress of Work.

I. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.

J. Intoxicating beverages or narcotics shall not be brought upon the premises nor shall Contractor’s personnel be under the influence of these substances while on the premises.

3.3 SECURITY CLEARANCES AND RESTRICTIONS

A. FMDC REQUIRED FINGERPRINTING FOR CRIMINAL BACKGROUND AND WARRANTS CHECK

1. All employees of the Contractor are required to submit fingerprints to the Missouri State Highway Patrol to enable the Office of Administration, Division of Facilities Management, Design and Construction (FMDC) to receive state and national criminal background checks on such employees.

2. FMDC reserves the right to prohibit any employee of the Contractor from performing work in or on the premises of any facility owned, operated, or utilized by the State of Missouri for any reason.

3. The Contractor shall ensure all of its employees submit fingerprints to the Missouri State Highway Patrol and pay for the cost of such background checks. The Contractor shall submit to FMDC via email to FMDCSecurity@oa.mo.gov a list of the names of the Contractor’s employees who will be fingerprinted and a signed Missouri Applicant Fingerprint Privacy Notice, Applicant Privacy Rights and Privacy Act Statement for each employee. All employees of the Contractor approved by FMDC to work at a State facility must obtain a contractor ID badge from FMDC prior to beginning work on-site, unless the Director of FMDC, at the Director’s discretion, waives the requirement for a contractor ID badge. The Contractor and its employees must comply with the process for background checks and contractor ID badges found on FMDC’s website at: https://oa.mo.gov/fmdc-contractor-id-badges.

4. Pursuant to section 43.540, RSMo, FMDC participates in the Missouri Rap Back and National Rap Back programs as of August 28, 2018. This means that the Missouri State Highway Patrol, Central Records Repository, and the Federal Bureau of Investigation will retain the fingerprints submitted by each of the Contractor’s employees, and those fingerprints will be searched against other fingerprints on file, including latent fingerprints. While retained, an employee’s fingerprints may continue
to be compared against other fingerprints submitted or retained by the Federal Bureau of Investigation, including latent fingerprints.

5. As part of the Missouri and National Rap Back programs, FMDC will receive notification if a new arrest is reported for an employee whose fingerprints have been submitted for FMDC after August 28, 2018. If the employee is performing work on a State contract at the time of the arrest notification, FMDC will request and receive the employee’s updated criminal history records. If the employee is no longer performing work on a State contract, FMDC will not obtain updated criminal records.

6. Pursuant to section 43.540, RSMo, the Missouri State Highway Patrol will provide the results of the employee’s background check directly to FMDC. FMDC may NOT release the results of a background check to the Contractor or provide the Contractor any information obtained from a background check, either verbally or in writing. FMDC will notify the Contractor only whether an employee is approved to work on State property. Each employee who submits fingerprints to the Missouri State Highway Patrol has a right to obtain a copy of the results of his or her background check. The employee may challenge the accuracy and completeness of the information contained in a background check report and obtain a determination from the Missouri State Highway Patrol and/or the FBI regarding the validity of such challenge prior to FMDC making a final decision about his or her eligibility to perform work under a State contract.

7. The Contractor shall notify FMDC via email to FMDCSecurity@oa.mo.gov if an employee is terminated or resigns from employment with the Contractor. If the Contractor does not anticipate performing work on a State contract in the future, the Contractor may request that FMDC remove its employees from the Rap Back programs. However, if removed from the Rap Back programs, employees will be required to submit new fingerprints should the contractor be awarded another State contract.

8. Upon award of a Contract, the Contractor should contact FMDC at FMDCSecurity@oa.mo.gov to determine if its employees need to provide a new background check. If a Contractor’s employee has previously submitted a fingerprint background check to FMDC as part of the Missouri and National Rap Back programs, the employee may not need to submit another fingerprint search for a period of three to six years, depending upon the circumstances. The Contractor understands and agrees that FMDC may require more frequent background checks without providing any explanation to the Contractor. The fact that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

3.4 DISRUPTION OF UTILITIES

A. The Contractor shall give minimum (72) hours written notice to the Construction Representative and Facility Representative before disconnecting electric, gas, water, fire protection, or sewer service to any building.

B. The contractor shall give minimum (72) hours written notice to the Construction Representative and Facility Representative before closing any access drives and shall make temporary access available if possible. Do not obstruct streets, walks, or parking.
3.5 HIPPI REQUIREMENTS

A. Business Associate Provisions policy will be made available if not included in the Division 00 of the Project Manual.

B. Contractor shall not use or disclose Protected Health Information other than as permitted or required by contract.

C. Contractor shall use appropriate administrative, physical, and technical safeguards to prevent use or disclosure of PHI including:
   1. Workforce training
   2. Policies and procedures
   3. Encryption of any electronic communication with PHI

D. Contractor shall report to the Central Office Representative any breach immediately upon becoming aware of an incident and shall take immediate action to stop the continuation of any such incident.

END OF SECTION 013513.28
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, 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, 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
   7. Storm and sanitary sewer

C. Support facilities include, but are not limited to, the following:
   1. Field offices and storage sheds
   2. Temporary roads and paving
   3. Dewatering facilities and drains
   4. Temporary enclosures
   5. Hoists and temporary elevator use
   6. Temporary project identification signs and bulletin boards
   7. Waste disposal services
   8. Rodent and pest control
   9. Construction aids and miscellaneous services and facilities

D. Security and protection facilities include, but are not limited to, the following:
   1. Temporary fire protection
   2. Barricades, warning signs, and lights
   3. Sidewalk bridge or enclosure fence for the site
   4. Environmental protection
1.3 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within (15) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations 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

   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.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. 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 onsite.
PART 2 - PRODUCTS

2.1 MATERIALS

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

B. Lumber and Plywood: Comply with requirements in Division 6 Section “Rough Carpentry”.
   1. For job-built temporary office, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
   2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.
   3. For fences and vision barriers, provide minimum 3/9” (9.5mm) thick exterior plywood.
   4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8” (16mm) thick exterior plywood.

C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary office, shops, and shed.

E. Paint: Comply with requirements of Division 9 Section “Painting”.
   1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
   2. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
   3. For interior walls of temporary offices, provide two (2) quarts interior latex-flat wall paint.

F. 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.

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

H. Open-Mesh Fencing: Provide 0.120” (3mm) thick, galvanized 2” (50mm) chainlink fabric fencing 6’ (2m) high with galvanized steel pipe posts, 1½” (38mm) ID for line posts and 2½” (64mm) ID for corner posts.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Designer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
B. Water Hoses: Provide ¾” (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100’ (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixture where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

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.

B. Provide each Facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner’s easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Contract Change.

B. Temporary Water Service: The Owner will provide water for construction purposes from the existing building system. All required temporary extensions shall be provided and removed by the Contractor. Connection points and methods of connection shall be designated and approved by the Construction Representative.

1. Exercise measures to conserve water.
2. Provide temporary pipe insulation to prevent freezing.

C. Temporary Electric Power Service: The Owner will provide electric power for construction lighting and power tools. Contractors using such services shall pay all costs of temporary services, circuits, outlet, extensions, etc.

1. Do not disrupt Owner’s need for continuous service.
2. Exercise measures to conserve energy.
3. Provide temporary electric feeder from existing building electrical service at locations as directed by Construction Representative.
4. Power Service Characteristics: 120/208 volt, 400 ampere, three phase, four wire.
5. Complement existing power service capacity and characteristics as required.
6. Provide main service disconnect and over-current protection at convenient location and meter.
7. Permanent convenience receptacles may be utilized during construction.
8. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting...
that will provide adequate illumination for construction operations and traffic conditions.

2. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

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

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

5. Maintain lighting and provide routine repairs.

6. Permanent building lighting may be utilized during construction.

E. Temporary Heating and Cooling: The normal heating and/or cooling system of the building shall be maintained in operation during the construction. If work is being performed in occupied resident’s space, residents must be able to maintain control of the temperature (heating and cooling) in their resident room.

1. Provide heating or cooling devices as needed to maintain specified conditions for construction operations.

2. Maintain minimum ambient temperature of 50 degrees F and maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

3. Owner’s existing heating and cooling plant may be used.

4. Prior to operation of permanent equipment for temporary heating or cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

F. Temporary Telephones: Contractor shall provide their own telephones communication.

G. Temporary Ventilation: Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

H. Temporary Toilets: Install self-contained toilet units. Use of pit-type privies will not be permitted. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project’s needs.

1. Shield toilets to ensure privacy.

2. Provide separate facilities for male and female personnel.

3. Provide toilet tissue materials for each facility.

I. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a health and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
1. Provide paper towels or similar disposable materials for each facility.

2. Provide covered waste containers for used material.

3. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.

J. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.

1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45°F to 55°F (7°C to 13°C).

K. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings.

C. Storage facilities: Install storage sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere onsite.

D. Storage Facilities: Limited areas for storage of building materials are available onsite. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.

E. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Designer.

1. Paving: Comply with Division 2 Section “Hot-Mixed Asphalt Paving” for construction and maintenance of temporary paving.

2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.

3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

F. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.

G. Construction Parking: Contractors must be prepared to discuss their storage and parking needs at the Pre-Bid Meeting.

H. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
   1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.
   2. Install tarpaulins securely with incombustible wood framing and other materials. Close openings of 25SqFt (2.3SqM) or less with plywood or similar materials.
   3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
   4. Where temporary wood or plywood enclosure exceeds 100SqFt (9.2SqM) in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

J. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

K. Temporary Elevator Use: The Owner will allow use of elevators within the building. All construction personnel will be allowed access only to those specific elevators designated by the Construction Representative.

L. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
   1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

M. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

N. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

O. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures are regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

P. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.

4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project complete installation of the permanent fire-protection facility including connected services and place into operation and use. Instruct key personnel on use of facilities.
D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.

E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
   1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
   2. Provide plywood fence, 8’ (2.5m) high, framed with (4) 2”x4” (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8’ (2.5m) apart.

F. Covered Walkway: Erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
   1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Designer. **Contractor shall maintain 42” clear in all hallways at all times.**

G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
   1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

H. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

### 3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor’s property. The Owner reserves the right to take possession of project identification signs.

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
   a. Replace air filters and clean inside of ductwork and housing.
   b. Replace significantly worn parts and parts subject to unusual operating conditions.
   c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000
SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. General product requirements.
B. Re-use of existing products.
C. Transportation, handling, storage and protection.
D. Product option requirements.
E. Substitution limitations.
F. Procedures for Owner-supplied products.
G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2. RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Identification of Owner-supplied products.
B. Section 00 7213 - General Conditions, Article 3.1 - Acceptable Substitutions: Substitutions made during procurement and/or construction phases.
C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
D. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.3. REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2017.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4. SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 30 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.
B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.5. QUALITY ASSURANCE

PART 2 PRODUCTS

2.1. EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.2. NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Use of products having any of the following characteristics is not permitted:

1. Made outside the United States, its territories, Canada, or Mexico.
2. Made using or containing CFC's or HCFC's.
3. Made of wood from newly cut old growth timber.
4. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:

1. If used on interior, have lower emissions, as defined in Section 01 6116.
2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

D. Motors: Refer to Section 23 0513 - Common Motor Requirements for HVAC Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

2.3. PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.4. MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.
PART 3  EXECUTION

3.1.  SUBSTITUTION LIMITATIONS

   A.  See Section 00 7213 - General Conditions, Article 3.1 - Acceptable Substitutions: Substitutions made during procurement and/or construction phases.

3.2.  OWNER-SUPPLIED PRODUCTS

   A.  See Section 01 1000 - Summary, Article 1.8 for identification of Owner-supplied products.

   B.  Owner's Responsibilities:

        1.  Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.

        2.  Arrange and pay for product delivery to site.

        3.  On delivery, inspect products jointly with Contractor.

        4.  Submit claims for transportation damage and replace damaged, defective, or deficient items.

        5.  Arrange for manufacturers' warranties, inspections, and service.

   C.  Contractor's Responsibilities:

        1.  Review Owner reviewed shop drawings, product data, and samples.

        2.  Receive and unload products at site; inspect for completeness or damage jointly with Owner.

        3.  Handle, store, install and finish products.

        4.  Repair or replace items damaged after receipt.

3.3.  TRANSPORTATION AND HANDLING

   A.  Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

   B.  If special precautions are required, attach instructions prominently and legibly on outside of packaging.

   C.  Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

   D.  Transport and handle products in accordance with manufacturer's instructions.

   E.  Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

   F.  Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

   G.  Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

   H.  Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4.  STORAGE AND PROTECTION

   A.  Store and protect products in accordance with manufacturers' instructions.
B. Store with seals and labels intact and legible.

C. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
SECTION 01 6116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.2. RELATED REQUIREMENTS

1.3. DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Flooring.
4. Products making up wall and ceiling assemblies.
5. Thermal and acoustical insulation.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

1. Concrete.
2. Clay brick.
3. Metals that are plated, anodized, or powder-coated.
4. Glass.
5. Ceramics.
6. Solid wood flooring that is unfinished and untreated.
1.4. REFERENCE STANDARDS


D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.


I. SCS (CPD) - SCS Certified Products; Current Edition.

J. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.6. QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.

1. Wet-Applied Products: State amount applied in mass per surface area.

2. Paints and Coatings: Test tinted products, not just tinting bases.

3. Evidence of Compliance: Acceptable types of evidence are the following;
   a. Current UL (GGG) certification.
   b. Current SCS (CPD) Floorscore certification.
   c. Current SCS (CPD) Indoor Advantage Gold certification.
   d. Current listing in CHPS (HPPD) as a low-emitting product.
   e. Current CRI (GLP) certification.
   f. Test report showing compliance and stating exposure scenario used.

4. Product data submittal showing VOC content is NOT acceptable evidence.

5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1. MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.1. FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 01 6116
SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition.
C. Pre-installation meetings.
D. Cutting and patching.
E. Surveying for laying out the work.
F. Cleaning and protection.
G. Starting of systems and equipment.
H. Demonstration and instruction of Owner personnel.
I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
J. General requirements for maintenance service.

1.2. RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
B. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
C. Section 07 8400 - Firestopping.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. Section 01 3300 - Submittals: Submittals procedures, shop drawings, product data, and samples.
B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.
C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.

2. Identify demolition firm and submit qualifications.

3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.

2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.


5. Work of Owner or separate Contractor.

1.5. QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

1. Minimum of 5 years of documented experience.

B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.6. PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

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

D. Perform dewatering activities, as required, for the duration of the project.

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

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
   2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
   3. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.

I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.7. COORDINATION

A. See Section 01 1000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
PART 2 PRODUCTS

2.1. PATCHING MATERIALS

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

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

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2. PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3. PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4. LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.5. GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6. ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
   4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.7. CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

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

G. Restore work with new products in accordance with requirements of Contract Documents.

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

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.8. PROGRESS CLEANING

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

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

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

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.9. PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

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

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

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

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
3.10. SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.
B. Notify Architect and Owner seven days prior to start-up of each item.
C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify that wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.
G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11. DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.12. ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13. FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
B. Use cleaning materials that are nonhazardous.
C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
F. Clean filters of operating equipment.
G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
H. Clean site; sweep paved areas, rake clean landscaped surfaces.
I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
3.14. CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Owner will occupy portions of the building as specified in Section 01 1000.

F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15. MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 7000
SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cleaning during the Project.

B. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
   1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
   2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator for the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General
   1. Retain all stored items in an orderly arrangement allowing maximum access, not impending drainage or traffic, and providing the required protection of materials.
   2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
   3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the jobsite.
   4. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.

B. Site
1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.

3. Maintain the site in a neat and orderly condition at all times.

C. Structures

1. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, sweep all interior spaces clean. “Clean” for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.

3. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily while work is being performed in the space in which finish materials have been installed. “Clean” for the purposes of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Construction Representative, may be injurious to the finish of the finish floor material.

3.2 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer’s instructions.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.

2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

3. Remove petrochemical spills, stains, and other foreign deposits.

4. Remove tools, construction equipment, machinery, and surplus material from the site.

5. Remove snow and ice to provide safe access to the building.

6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.


9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.

10. Clean transparent material, 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. Polish mirrors and glass, taking care not to scratch surfaces.

11. Remove labels that are not permanent labels.

12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
   a. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.

13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.

15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

16. Clean ducts, blowers, and coils if units were operated without filters during construction.

17. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.

18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.

19. Leave the Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.

D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
1. Where extra materials of value remain after Final Acceptance by the Owner, they become the Owner’s property.

END OF SECTION 017400
SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Operation and Maintenance Data.
B. Warranties and bonds.

1.2. RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions and 00 7300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
B. Section 01 3300 - Submittals: Submittals procedures, shop drawings, product data, and samples.
C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
D. Individual Product Sections: Specific requirements for operation and maintenance data.
E. Individual Product Sections: Warranties required for specific products or Work.

1.3. SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.
C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.
PART 3 EXECUTION

2.1. OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

2.2. OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.


D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

2.3. OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.
E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Additional Requirements: As specified in individual product specification sections.

2.4. ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
2.5. WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION 01 7800
SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1. SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. HVAC systems and equipment.
   2. Plumbing equipment.
   3. Electrical systems and equipment.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.

1.2. RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

1.3. SUBMITTALS

A. Section 01 3300 - Submittals: Submittals procedures, shop drawings, product data, and samples.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such as slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.4. QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2. TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner’s personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 7900
SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.
B. Abandonment and removal of existing utilities and utility structures.

1.2. RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
B. Section 01 1000 - Summary: Sequencing and staging requirements.
C. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
E. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
F. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.3. REFERENCE STANDARDS


1.4. QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of 5 years of documented experience.

PART 3 EXECUTION

2.1. SCOPE

A. Remove portions of existing buildings as designated on the drawings in the following sequence:
B. Remove paving and curbs as required to accomplish new work.
C. Remove concrete slabs on grade within construction limits indicated on drawings.
D. Remove fences and gates.
E. Remove other items indicated, for salvage, relocation, and recycling.
2.2. GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   6. Do not close or obstruct roadways or sidewalks without permit.
   7. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.3. EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

2.4. SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

2.5. DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.
C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 4100
SECTION 03 0100 - MAINTENANCE OF CONCRETE

PART 1  GENERAL

1.1. SECTION INCLUDES
   A. Cleaning of existing concrete surfaces.
   B. Scope of Work: As indicated on drawings.

1.2. RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.3. PRICE AND PAYMENT PROCEDURES

1.4. REFERENCE STANDARDS
   A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.5. SUBMITTALS
   A. See Section 01 3300 - Submittals for submittal procedures.
   B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
   C. Manufacturer's Qualification Statement and instructions.

1.6. QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
   B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING
   A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2  PRODUCTS

2.1. CLEANING MATERIALS
   A. Degreaser:
      1. Manufacturers:
         a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
B. Detergent: Non-ionic detergent.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that surfaces are ready to receive work.
B. Beginning of installation means acceptance of substrate.

3.2. PREPARATION

A. Prepare concrete surfaces to be repaired according to ICRI 310.2R, .

3.3. CLEANING EXISTING CONCRETE

A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.

B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
   1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
   2. Clean out cracks and voids using same methods.

C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
   1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
   2. Increasing the water washing pressure to maximum of 400 psi.
   3. Adding detergent to washing water; with final water rinse to remove residual detergent.
   4. Steam-generated low-pressure hot-water washing.

END OF SECTION 03 0100
SECTION 03 1000 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
B. Openings for other work.
C. Form accessories.
D. Form stripping.

1.2. RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.
B. Section 03 3000 - Cast-in-Place Concrete.
C. Section 05 1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.3. REFERENCE STANDARDS

B. ACI 301 - Specifications for Structural Concrete; 2016.
C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
D. ACI 347R - Guide to Formwork for Concrete; 2014.
E. PS 1 - Structural Plywood; 2009.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data on void form materials and installation requirements.
C. Design Data: As required by authorities having jurisdiction.

1.5. QUALITY ASSURANCE

A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State in which the Project is located.
B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.1. FORMWORK - GENERAL
A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.2. WOOD FORM MATERIALS
A. Form Materials: At the discretion of the Contractor.

2.3. FORMWORK ACCESSORIES
A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
B. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.

PART 3 EXECUTION

3.1. EXAMINATION
A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2. EARTH FORMS
A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3. ERECTION - FORMWORK
A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.4. APPLICATION - FORM RELEASE AGENT
A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5. INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

3.6. FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

3.7. FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.8. FIELD QUALITY CONTROL

A. Contractor to provide independent testing agency to perform field quality control tests as necessary.

3.9. FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION 03 1000
SECTION 03 2000 - CONCRETE REINFORCING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.2. RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 3000 - Cast-in-Place Concrete.

1.3. REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).


H. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.5. QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

1. Maintain one copy of each document on project site.

B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.
PART 2 PRODUCTS

2.1. REINFORCEMENT

A. Reinforcing Steel:  ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Plain billet-steel bars.
   2. Unfinished.

B. Stirrup Steel:  ASTM A1064/A1064M steel wire, unfinished.

C. Steel Welded Wire Reinforcement (WWR):  Galvanized, deformed type;  ASTM A1064/A1064M.
   1. Form:  Flat Sheets.
   2. WWR Style:  4 x 8-W6 x W10.

D. Reinforcement Accessories:
   1. Tie Wire:  Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers:  Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.2. FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of Architect.  Perform welding in accordance with AWS D1.4/D1.4M.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Architect.

PART 3 EXECUTION

3.1. PLACEMENT

A. Place, support and secure reinforcement against displacement.  Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows:
   1. Walls (exposed to weather or backfill): 2 inch.
   2. Footings and Concrete Formed Against Earth: 3 inch.
   3. Slabs on Fill: 2 inch.

E. Comply with applicable code for concrete cover over reinforcement.

F. Bond and ground all reinforcement to requirements of Section 26 0526.
3.2. FIELD QUALITY CONTROL

A. Contractor to provide independent testing agency to inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION 03 2000
SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Floors and slabs on grade.
B. Concrete shear walls and foundation walls.
C. Concrete foundations and anchor bolts for pre-engineered building.
D. Concrete reinforcement.
E. Joint devices associated with concrete work.
F. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.
G. Concrete curing.

1.2. RELATED REQUIREMENTS

A. Section 03 3511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.
B. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.3. REFERENCE STANDARDS

C. ACI 301 - Specifications for Structural Concrete; 2016.
D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
H. ACI 308R - Guide to External Curing of Concrete; 2016.
I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
J. ACI 347R - Guide to Formwork for Concrete; 2014.


X. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.


AB. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

AC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).

AD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

AE. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.

F. Test Reports: Submit report for each test or series of tests specified.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5. QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.6. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for life of the concrete.
   1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
   2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

C. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.
PART 2 PRODUCTS

2.1. FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Steel.
   2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.2. REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.3. CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Calcined Pozzolan: ASTM C618, Class N.

E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4. ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.
C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
   1. Provide admixture in slabs to receive adhesively applied flooring.
   2. Manufacturers:
      a. Barrier One, Inc; Barrier One Moisture Vapor Reduction Admixture: www.barrierone.com/#sle.
      b. Hycrete, Inc; W500: www.hycrete.com/#sle.
      c. ISE Logik Industries, Inc; MVRA 900: www.iselogik.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

2.5. ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Installation: Comply with ASTM E1643.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   3. Manufacturers:
      b. Inteplast Group; Barrier-Bac VB-350: www.barrierbac.com/#sle.
      c. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
      d. Poly-America; Husky Yellow Guard Class A 15 mil Vapor Barrier: www.yellowguard.com/#sle.
      e. Stego Industries, LLC: www.stegoindustries.com/#sle.

2.6. BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
   1. Manufacturers:
      b. Kaufman Products Inc; SureBond: www.kaufmanproducts.net/#sle.
      c. Kaufman Products Inc; SureWeld: www.kaufmanproducts.net/#sle.
B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: Closed-cell, non-absorbent, compressible polymer foam in sheet form.
   2. Manufacturers:
      c. King Packaged Materials Company; Sakrete concrete expansion joint: www.king-products.com

2.7. CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
   1. Manufacturers:
      a. Dayton Superior Corporation; AquaFilm Concentrate J74: www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company; EUCOBAR: www.euclidchemical.com/#sle.
      c. Kaufman Products Inc; VaporAid: www.kaufmanproducts.net/#sle.
      d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
      e. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.

   1. Application: Use at interior slabs.
   2. Product dissipates within 4 to 6 weeks.
   3. Provide product containing fugitive red dye.
   4. Manufacturers:

C. Curing and Sealing Compound, Moisture Emission Reducing: Liquid, membrane-forming, clear sealer, for application to newly placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   3. VOC Content: Less than 100 g/L.

5. Manufacturers:
   a. Floor Seal Technology, Inc; VaporSeal 309 System: www.floorseal.com/#sle.
   c. Bone Dry Products, Inc.; Bone dry concrete sealer; www.bonedryproducts.com

D. Moisture-Retaining Sheet: ASTM C171.
   1. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

E. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.

F. Water: Potable, not detrimental to concrete.

2.8. CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag,
      silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial
   mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing
      and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or
   required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000
      pounds per square inch.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Cement Content: Minimum 520 pounds per cubic yard.
   6. Water-Cement Ratio: Maximum 40 percent by weight.
   7. Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.

2.9. MIXING

A. Transit Mixers: Comply with ASTM C94/C94M. and furnish batch tickets.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2
      hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to
      60 minutes.
B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3  EXECUTION

3.1. EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2. PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use latex bonding agent only for non-load-bearing applications.

F. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

G. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

H. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.3. INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
3.4. VAPOUR BARRIER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

2. 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.

3. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
   a. Seal vapor barrier to the entire slab perimeter per manufacturer's instructions.
   b. Option to install above; Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided Tack Tape, or both Term Bar and StegoTack Tape, per manufacturer’s instructions. Ensure the concrete is clean and dry prior to adhering tape.

4. Overlap joints 6 inches and seal with manufacturer’s seam tape.

5. Apply seam tape/Crete Claw to a clean and dry vapor barrier.

6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into center hub. Ensure center hub's peel-and-stick adhesive base is fully adhered to the vapor barrier.

7. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.

8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.

9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

10. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer’s instructions prior to placing concrete.

3.5. PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.
3.6. SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.7. FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.8. CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings. Minimum 1/8" per 1'-0"

3.9. CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such
materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   a. Spraying: Spray water over floor slab areas and maintain wet.
   b. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3. Final Curing: Begin after initial curing but before surface is dry.
   a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.10. FIELD QUALITY CONTROL

A. Contractor to provide independent testing agency for quality control.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.11. DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.
3.12. PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.13. SCHEDULE - CONCRETE TYPES AND FINISHES

   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Maximum W/C Ratio: 0.47.
   3. Slump Limit: 4 inches, plus or minus 1 inch.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Maximum W/C Ratio: 0.50.
   4. Slump Limit: 4 inches, plus or minus 1 inch.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

END OF SECTION 03 3000
SECTION 04 0511 - MORTAR AND MASONRY GROUT

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Mortar for masonry.
B. Grout for masonry.

1.2. RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.
B. Section 04 4313 - Stone Masonry Veneer: Installation of mortar.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.
C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

E. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

1.5. QUALITY ASSURANCE

1.6. DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.7. FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1. MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.


1. Masonry below grade and in contact with earth: Type S.
2. Exterior Masonry Veneer: Type N.
3. Interior, Loadbearing Masonry: Type N.
4. Interior, Non-loadbearing Masonry: Type O.

C. Grout Mix Designs:

1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
   a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
   b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.2. MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

   1. Type: Type N.

B. Portland Cement: ASTM C150/C150M.

   1. Type: Type I - Normal; ASTM C150/C150M.

C. Masonry Cement: ASTM C91/C91M.
1. Type: Type N; ASTM C91/C91M.
D. Hydrated Lime: ASTM C207, Type S.
E. Quicklime: ASTM C5, non-hydraulic type.
F. Mortar Aggregate: ASTM C144.
H. Water: Clean and potable.
I. Bonding Agent: Latex type.

2.3. MORTAR MIXING
A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
B. Maintain sand uniformly damp immediately before the mixing process.
C. Do not use anti-freeze compounds to lower the freezing point of mortar.
D. If water is lost by evaporation, re-temper only within two hours of mixing.

2.4. GROUT MIXING
A. Mix grout in accordance with ASTM C94/C94M.
B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

PART 3 EXECUTION

3.1. PREPARATION
A. Apply bonding agent to existing concrete surfaces.
B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.2. INSTALLATION
A. Install mortar and grout to requirements of section(s) in which masonry is specified.
B. Work grout into masonry cores and cavities to eliminate voids.
C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.
D. Do not displace reinforcement while placing grout.
E. Remove excess mortar from grout spaces.

3.3. GROUTING
A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of contract documents.
B. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

C. High-Lift Grouting:
   1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
   2. Place grout for spanning elements in single, continuous pour.

END OF SECTION 04 0511
SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Flashings.

F. Accessories.

1.2. RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout.

B. Section 04 4313 - Stone Masonry Veneer: Stone bonded to masonry back-up.

C. Section 05 5000 - Metal Fabrications: Loose steel lintels.

D. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.3. REFERENCE STANDARDS


F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.


J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.5. SUBMITTALS

A. See Section 01 33 00 - Submittals, for submittal procedures.
B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
C. Samples: Submit 2 samples of facing brick units to illustrate color, texture, and extremes of color range.
D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.6. QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
PART 2 PRODUCTS

2.1. CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Special Shapes: Provide non-standard blocks configured for corners.
      a. Provide bullnose units for outside corners.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.

2.2. BRICK UNITS

A. Manufacturers:
   4. Substitutions: See section 01 6000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture: New to match existing.
   2. Nominal size: As indicated on drawings.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.3. MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range new to match existing.
   2. Manufacturers:
      a. Davis Colors, a division of Venator Materials PLC; www.daviscolors.com/#sle.


G. Water: Clean and potable.

H. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type N.

I. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
   1. Type: Fine.
   2. Manufacturers:
      a. Amerimix, an Oldcastle brand; AMX 600:  www.amerimix.com/#sle.
      b. Spec Mix; Core fill Grout (CF-03).
      c. Ash Grove Pro Mix Core Fill Grout.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.4. REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   3. WIRE-BOND; www.wirebond.com/#sle.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Ladder.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
F. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
   3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
   4. Vertical adjustment: Not more than 1 1/4 inches.
   5. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
   6. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 3-1/2 inches.

2.5. FLASHINGS

A. Membrane Non-Asphaltic Flashing Materials:
   1. Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil thick with pressure-sensitive adhesive and release paper.
      a. Manufacturers:
         1) Hohmann & Barnard, Inc; Textroflash: www.h-b.com/#sle.
         2) WIRE-BOND; Aquaflash 500: www.wirebond.com/#sle.
         3) Masonpro, Inc. York Seal – 40 mil (Self-Adhering) Flashing: www.masonpro.com

B. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

C. Termination Bars: Stainless steel; compatible with membrane and adhesives.

D. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.6. ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
c. WIRE-BOND; www.wirebond.com/ste.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
   a. Manufacturers:
      1) Advanced Building Products Inc; Mortar Break DT: www.advancedbuildingproducts.com/ste.
      3) York Manufacturing, Inc; www.yorkmfg.com/ste.

C. Weeps:
   1. Type: Extruded propylene with honeycomb design.
   2. Color(s): As selected by Architect from manufacturer's full range.
   3. Manufacturers:
      e. WIRE-BOND; www.wirebond.com.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that field conditions are acceptable and are ready to receive masonry.
   B. Verify that related items provided under other sections are properly sized and located.
   C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2. PREPARATION
   A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
   B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3. COLD AND HOT WEATHER REQUIREMENTS
   A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
3.4. COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.

3.5. PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners, except for units laid in stack bond.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, or cavity insulation vapor barrier adhesive is applied.

I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6. WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.7. CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
C. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
   1. Verify that airspace width is no more than 3/8 inch greater than panel thickness.
   2. Hold cavity mortar control panel tight to face wythe.
   3. Stagger end joints in adjacent rows.
   4. Fit to perimeter construction and penetrations without voids.

D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8. REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, and CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.9. REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.10. MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Install vertical leg of flashing behind water-resistant barrier sheet over backing.
2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Support flexible flashings across gaps and openings.

E. Extend plastic, laminated, and EPDM flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.11. LINTELS

A. Install loose steel lintels over face brick openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
   1. Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
   2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
   3. Openings over 78 inches: Reinforce openings as detailed.
   4. Do not splice reinforcing bars.
   5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
   6. Place and consolidate grout fill without displacing reinforcing.
   7. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 8 inch bearing on each side of opening.

3.12. GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.13. CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

D. Form expansion joint as detailed on drawings.
3.14. BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.15. TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16. CUTTING AND FITTING

A. Cut and fit for chases, pipes, and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.17. CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.18. PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 2000
SECTION 04 2616 - ADHERED MASONRY VENEER

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Thin Brick.
B. Adhesives.
C. Accessories.

1.2. RELATED REQUIREMENTS

A. Section 04 7300 - Manufactured Stone Masonry: Adhered Masonry Veneer.
B. Section 06 1000 - Rough Carpentry: Wood stud backup for masonry veneer.
C. Section 09 2236 - Lath: Metal furring and lathing for veneer applications.
D. Section 09 3000 - Tiling: Wall tile for veneer applications.

1.3. REFERENCE STANDARDS

B. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data for thin brick units, mortar, grout, and adhesive.
C. Samples: Submit four samples of thin brick units to illustrate color, texture, and extremes of color range.

1.5. QUALITY ASSURANCE

A. Maintain one copy of the ANSI A108/A118/A136 and TCNA (HB) on site.
B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
1.6. MOCK-UP
   A. Construct a mock-up panel sized 8 feet long by 6 feet high; include mortar, grout, adhesives, accessories, substrate, and representative wall openings in mock-up.
   B. Locate where directed.
   C. Mock-up may remain as part of the Work.

1.7. DELIVERY, STORAGE, AND HANDLING
   A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
   B. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.8. FIELD CONDITIONS
   A. Do not install adhesives in an unventilated environment.
   B. Maintain materials and surrounding air temperature to minimum 40°F prior to, during, and 48 hours after completion of masonry work.
   C. Maintain materials and surrounding air temperature to maximum 90°F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1. THIN BRICK
   A. Manufacturers:
      2. Endicott Clay Products Co; : www.endicott.com/#sle.
      1. Type: TBX.
      2. Size: Manufacturer's standard Modular.
      4. Tolerances: 1/16 inch.
      5. Color, Texture, Range, Special Shapes: As indicated.
      6. Color, Texture, Range, Special Shapes: As selected by Architect from manufacturer's standard range of colors, textures and blends.

2.2. ADHESIVE MATERIALS
   A. Manufacturers:
2. LATICRETE International, Inc; LATICRETE MVIS Hi-Bond Mortar: www.laticrete.com/#sle.

B. Thin-Set Mortar: ANSI A118.4, polymer-modified; freeze-thaw stable.

2.3. LATH
A. Metal Lath Materials: As specified in Section 09 2326.23.
B. Diamond Mesh Metal Lath: ASTM C847, galvanized; 
1. Weight: To suit application 2.5 lb/sq yd. minimum and as specified in ASTM C841 for framing spacing.
2. Backed with treated paper.
C. Glass-Fiber Lath: Open weave, self-furred, 1/8 inch thick glass fiber reinforcing lath, 39 inches wide and weighing 4.34 ounces per yard.
D. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.
E. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths.
1. Material: Formed sheet steel with rust inhibitive primer, expanded metal flanges.
2. Material: PVC, open grid flanges or perforated with nailing holes.

2.4. ACCESSORIES
A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION
3.1. EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive thin brick veneer.
B. Verify that related items provided under other sections are properly sized and located.
C. Verify that built-in items are in proper location, and ready for installation of thin brick veneer.

3.2. INSTALLATION
3.3. COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.

3.4. PLACING AND BONDING

A. Remove excess mortar as work progresses.

B. Interlock intersections and external corners, except for units laid in stack bond.

C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove and replace.

D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

END OF SECTION 04 2616
SECTION 04 4313 - STONE MASONRY VENEER

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Cut stone veneer at exterior walls.
B. Metal anchors and accessories.
C. Setting mortar.

1.2. RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout: Setting and pointing mortar.
B. Section 04 2000 - Unit Masonry: Joint reinforcement, Ties, and Anchors.
C. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.3. REFERENCE STANDARDS

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data on stone units, mortar, and reinforcement.
C. Samples: Submit two stone samples illustrating minimum and maximum stone sizes, color range, texture, and markings.
D. Samples: Submit mortar color samples.

1.6. QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum 5 years of documented experience.
1.7. **MOCK-UP**

A. Construct stone wall mock-up, 6 feet long by 6 feet wide; include stone anchor accessories, corner condition, and typical control joint in mock-up.

B. Locate where directed.

1.8. **DELIVERY, STORAGE, AND HANDLING**

A. Protect stone from discoloration during storage on site.

B. Provide ventilation to prevent condensation from forming on stone.

1.9. **FIELD CONDITIONS**

A. Cold Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

**PART 2 PRODUCTS**

2.1. **MANUFACTURERS**

A. Provide same material but (full depth nominal 4" thick) as specified in Section 047300 - Manufactured Stone Masonry.

      a. Harvest Mix3-9" Snapped.

B. Other Acceptable Stone Quarriers:


C. Stone Masonry Reinforcement and Accessories

   3. WIRE-BOND;  www.wirebond.com/#sle.

2.2. **STONE**

A. Limestone: Indiana Oolitic Limestone; complying with ASTM C568/C568M Classification II - Medium Density.

   1. Grade: Rustic, per ILI Handbook.
   2. Color: Limestone Tan/Gray; Blended array of the Aux Vases Blue & Buff, Rustic Cleft Blue & Buff and Chocolate Marble.

B. Surface Texture: Cleft Face.

C. Color: Basis of Design Earthworks Harvest Mix 3-9" Snapped.
2.3. MORTAR
   A. Setting Mortar: ASTM C270, Type S, using the Proportion Method as specified in Section 04 0511.
   B. Pointing Mortar: Type N as specified in Section 04 0511, and using the Property Method in ASTM C270.

2.4. ACCESSORIES
   A. Horizontal Joint Reinforcement: Truss type; stainless steel wire conforming to ASTM A580/A580M Type 304, 3/16 inch diameter side rods with 0.1483 inch diameter cross ties.
   B. Wall Ties: Formed steel wire, at least 0.059 inch diameter, stainless steel conforming to ASTM A580/A580M, eye and pintle type, with provision for vertical adjustment after attachment.
   C. Other Anchors in Direct Contact with Stone: ASTM A666, Type 304, stainless steel, of sizes and configurations required for support of stone and applicable superimposed loads.
   D. Setting Buttons and Shims: Lead.
   E. Flashings and Cavity drainage material as specified in Section 042000 - Unit masonry
   F. Weep/Cavity Vents: Polyethylene tubing.
   G. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.5. STONE FABRICATION
   A. Nominal Thickness: 4 inch.
   B. Nominal Face Size: 3” to 9” inch.
   C. Pattern and Coursing: Ashlar.
   D. Fabricate for 3/8 inch beds and joints.
   E. Bed and Joint Surfaces:
      1. Cut or sawn full square for full thickness of unit.
      2. Sawn or cut full square at least two-thirds of unit thickness; from that point back under square not more than 1 inch in 12 inches.
   F. Backs: Sawn.
   G. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.
   H. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.
   I. Cut drip slot in bottom surface of work projecting more than 1/2 inch over window frame. Size slot not less than 3/8 inch wide and 1/4 inch deep for full width of projection.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that support work and site conditions are ready to receive work of this section.
B. Verify that items built-in under other sections are properly located and sized.

3.2. PREPARATION

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Clean stone prior to erection. Do not use wire brushes or implements that mark or damage exposed surfaces.

C. Clean sawn surfaces of rust stains and iron particles.

3.3. INSTALLATION

A. Cut stone at site to produce clean faces.

B. Size stone units to fit opening dimensions and perimeter conditions.

C. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.

D. Arrange stone pattern to provide color uniformity and minimize visual variations, and provide a uniform blend of stone unit sizes.

E. Provide setting and pointing mortar in accordance with Section 04 0511.
   1. If water is lost by evaporation, re-temper mortar only within two hours after mixing.
   2. At ambient air temperature 80 degrees F and above, use mortar within two hours after mixing; at ambient air temperature below 50 degrees F, use mortar within two-and-one-half hours after mixing.

F. Fill dowel holes in stone units with mortar.

G. Arrange stone coursing in running bond with consistent joint width.

H. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.

I. Install weep/cavity vents in vertical stone joints at 24 inches on center horizontally; immediately above horizontal flashings, above shelf angles and supports, and at top of each cavity space; do not permit mortar accumulation in cavity space.

3.4. REINFORCEMENT AND ANCHORAGE

A. Install horizontal joint reinforcement 16 inches on center.

B. Place horizontal joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Embed wall ties in masonry back-up to bond veneer to back-up at maximum 16 inches on center vertically and 36 inches on center horizontally.

F. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.
3.5. JOINTS

A. Leave the following joints open for sealant:
   1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   2. Joints in projecting units.
   3. Joints between rigidly anchored units, including soffits, panels, and column covers.
   4. Joints below lugged sills and stair treads.
   5. Joints below ledge and relieving angles.
   6. Joints labeled "expansion joint".

B. Rake out mortar joints 5/8 to 3/4 inch and brush joints clean to accommodate pointing mortar. Fill joints with pointing mortar.

C. Pack mortar into joints and work into voids. Neatly tool surface to concave joint.

D. At joints to be sealed, clean mortar out of joint before it sets. Brush joints clean.

3.6. CLEANING

A. Remove excess mortar as work progresses, and upon completion of work.

B. Clean soiled surfaces with cleaning solution.

C. Use non-metallic tools in cleaning operations.

3.7. PROTECTION

A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

END OF SECTION 04 4313
SECTION 04 7200 - CAST STONE MASONRY

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Architectural cast stone.

B. Units required are indicated on drawings as "cast stone".

C. Units required are:
   1. Exterior wall units, including wall caps, coping, and sills.

1.2. RELATED REQUIREMENTS

A. Section 04 0511 - Mortar and Masonry Grout: Mortar for setting cast stone.

B. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

C. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.3. REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).


1.4.  SUBMITTALS

A.  See Section 01 3300 - Submittals for submittal procedures.

B.  Product Data:  Test results of cast stone components made previously by the manufacturer.

C.  Shop Drawings:  Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D.  Mortar Color Selection Samples.

E.  Verification Samples:  Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

1.5.  QUALITY ASSURANCE

A.  Manufacturer Qualifications:
   1.  A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2.  Current producer member of the Cast Stone Institute or the Architectural Precast Association.
   3.  Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
   4.  Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.6.  DELIVERY, STORAGE, AND HANDLING

A.  Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B.  Number each piece individually to match shop drawings and schedule.

C.  Store cast stone components and installation materials in accordance with manufacturer's instructions.

D.  Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E.  Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F.  Store mortar materials where contamination can be avoided.

G.  Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2  PRODUCTS

2.1.  MANUFACTURERS

A.  Architectural Cast Stone:
   1.  Any current producer member of the Cast Stone Institute.
3. Caliber Cast Stone; www.calibercaststone.com/

2.2. ARCHITECTURAL CAST STONE


1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
   a. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.

2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
   a. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4.0-8.0% for units exposed to freeze-thaw environments. Air entrainment is not required for Vibrant Dry Tamp (VDT) products.
   b. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5.0% after 300 cycles of freezing and thawing.

3. Absorption - ASTM C 1195: 6.0% maximum by the cold water method.

4. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.

5. Color: Selected by Architect from manufacturer's full range.

6. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.

1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.

2. Unless otherwise indicated on drawings, provide:
   a. Wash or slope of 1:12 on exterior horizontal surfaces.
   b. Drips on projecting components, wherever possible.
   c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.3. MATERIALS

A. Portland Cement: ASTM C150/C150M.

1. For Units: Type I, white or gray as required to match Architect’s sample.

2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.
E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
   1. Reinforce the units as required by the drawings and for safe handling and structural stress.
   2. Minimum reinforcing shall be 0.25 percent of the cross section area.
   3. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
   4. Units 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.
   5. Welded wire fabric reinforcing shall not be used in dry cast products.
   6. Galvanized in accordance with ASTM A767/A767M, Class I.
   7. Epoxy coated in accordance with ASTM A775/A775M.


I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, as specified in Section 04 0511; do not use masonry cement.

L. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without disoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.4. CURING

A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) 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.

2.5. MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than ±1/8 in. from approved dimensions.

B. Length of units shall not deviate by more than length/ 360 or ±1/8 in., whichever is greater, not to exceed ±1/4 in.
   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., 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., on unformed sides of unit, 3/8 in. maximum deviation.

2.6. SOURCE QUALITY CONTROL

A. Test compressive strength and absorption of specimens selected at random from plant production.
   1. Test in accordance with ASTM C642.
   2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 EXECUTION

3.1. EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.2. INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
   1. Drench cast stone components with clear, running water immediately before installation.
   2. Set units in a full bed of mortar unless otherwise indicated.
   3. Fill vertical joints with mortar.
   4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.3. CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.
   5. Apply water repellent in accordance with Cast Stone Institute® Technical Bulletin #35 or water repellent manufacturer’s directions.

3.4. PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION 04 7200
SECTION 04 7300 - MANUFACTURED STONE MASONRY

PART 1  GENERAL

1.1.  SECTION INCLUDES

A. Adhered manufactured stone masonry veneer (AMSMV) for interior and exterior application.
B. Installation materials.
C. Accessories.

1.2.  RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood stud backup for AMSMV; plywood and OSB sheathing.
B. Section 09 2236 - Lath: Lathing and accessories for scratch coat.

1.3.  REFERENCE STANDARDS

G. NCMA TEK 20-01 - Key Installation Checkpoints for Manufactured Stone Veneer; 2014.

1.4.  ADMINISTRATIVE REQUIREMENTS

1.5.  SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data for AMSMV units, mortar, lath, and rainscreen drainage material, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Color charts.
   4. Installation methods.
C. Shop Drawings: Submit detail drawings depicting proper installation and flashing techniques. Coordinate locations with those found on drawings.
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. Samples: Submit four samples of AMSMV units to illustrate color, texture, and extremes of color range.

F. Manufacturer's Certificate: Certify that AMSMV units and mortar meet or exceed specified requirements.

1.6. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.

1.7. MOCK-UP

A. Construct mock-up panel 4 feet long by 6 feet high; include AMSMV, mortar, accessories, substrate, and representative wall openings in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of the work.

1.8. DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Prevent mechanical damage and contamination by other materials.

C. Protect products from precipitation combined with freezing temperatures. Do not install products with visible frozen moisture.

D. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.

1.9. FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

1.10. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Provide same material (but in thin for adhered masonry veneer) stone as specified in Section 044313 - Stone Masonry Veneer.


a. Harvest Mix3-9" Snapped (thin for adhered masonry)
B. Other Acceptable Manufactures:

2.2. ADHERED STONE MASONRY VENEER

A. Limestone: Indiana Oolitic Limestone; complying with ASTM C568/C568M Classification II - Medium Density.
   1. Grade: Rustic, per ILI Handbook.
   2. Color: Limestone Tan/Gray; Blended array of the Aux Vases Blue & Buff, Rustic Cleft Blue & Buff and Chocolate Marble.
   3. Surface Texture: Cleft Face.

2.3. MORTAR APPLICATIONS

A. At Contractor's option, mortar may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Scratch Coat Mortars: Scratch coat mortars for application directly to metal lath.

C. Setting Bed Mortars: Setting bed used to adhere AMSMV units to scratch coat mortar or to bondable concrete or concrete masonry.

D. Setting Bed Mortars: Setting bed used to adhere AMSMV units to cement board.

E. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual AMSMV units once the setting bed mortar has sufficiently cured.

2.4. MORTAR MIXES

A. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
   1. Applications: Use this type of bond coat where indicated.
   2. Manufacturers:
      a. ARDEX Engineered Cements; www.ardexamericas.com/#sle.

2.5. ACCESSORIES

A. Lath: As specified in Section 09 2236.

B. Casing Beads, Weep Screeds, and Joint Accessories: As specified in Section 09 2236.

C. Bonding Compound: Provide type recommended for bonding scratch coat to solid surfaces, complying with ASTM C932.

D. Cleaning Solution: Non-acidic, not harmful to AMSMV work or adjacent materials, approved by AMSMV manufacturer.
PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that backup wall system construction conforms with AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

B. Verify that substrates to receive mortar scratch coat or setting bed conform with AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51:
   1. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

C. Verify that related items provided under other sections are properly sized and located.

D. Verify that built-in items are in proper location, and ready for installation of AMSMV.

3.2. PREPARATION

3.3. INSTALLATION - SCRATCH COAT

A. Apply mortar scratch coat of 1/2 inch nominal to cover metal lath in accordance with ASTM C926. Scratch surface when somewhat firm. If scratch coat dries before applying setting bed mortar and AMSMV, moisten scratch coat by misting it with water.

3.4. INSTALLATION - AMSMV

A. Install AMSMV with a cementitious mortar setting bed to a scratch coat backing surface, in accordance with AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

B. Mortar Joints: Concave.
   1. Style: Tight fit joints.

C. Windows, Doors and Wall Openings: Butt AMSMV units to wall opening.

D. Sills: Install sills where located on drawings.

E. Caps: Install capstones where located on drawings.

F. Seal all joints at wall openings and penetrations with sealant approved for use with AMSMV.

3.5. CONTROL AND EXPANSION JOINTS

A. Form joints as detailed on drawings.

3.6. TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.7. CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.8. CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean AMSMV in accordance with manufacturer's installation instructions.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.9. PROTECTION

A. Protect finished work from rain during and for 48 hours following installation.

B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 7300
SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1. SECTION INCLUDES

   A. Structural steel framing members.
   
   B. Base plates, expansion joint plates.
   
   C. Grouting under base plates.

1.2. RELATED REQUIREMENTS

   A. Section 05 1213 - Architecturally-Exposed Structural Steel Framing: Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).

1.3. REFERENCE STANDARDS

   
   
   
   
   
   
   
   
   I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
   

1.4. SUBMITTALS

   A. See Section 01 3300 - Submittals for submittal procedures.
   
   B. Shop Drawings:
      
      1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
      
      2. Connections not detailed.
      
      3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   
   C. Fabricator's Qualification Statement.
1.5. QUALITY ASSURANCE
   A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
   B. Fabricator: Company specializing in performing the work of this section with minimum 3 years of documented experience.

PART 2 PRODUCTS

2.1. MATERIALS
   A. Steel Angles and Plates: ASTM A36/A36M.
   B. Steel W Shapes and Tees: ASTM A992/A992M.
   C. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.
   D. Headed Anchor Rods: ASTM F1554, Grade 55, plain.
   E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
   F. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2. FABRICATION
   A. Shop fabricate to greatest extent possible.

2.3. FINISH
   A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.4. SOURCE QUALITY CONTROL
   A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 25 percent of bolts at each connection.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2. ERECTION
   A. Erect structural steel in compliance with AISC 303.
   B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
   C. Field weld components indicated on shop drawings.
D. Do not field cut or alter structural members without approval of Architect.

E. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.3. TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

END OF SECTION 05 1200
SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Formed steel joist and purlin framing and bridging.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

1.3. REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.


D. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2017.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.

1. Indicate floor joist and ceiling joist layout.

2. Design data:

E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

F. Designer's Qualification Statement.

G. Manufacturer's Qualification Statement.

1.5. QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Metal Framing:
   1. ClarkDietrich Building Systems; www.clarkdietrich.com/
   2. Marino; www.marinoware.com/
   3. The Steel Network, Inc; www.SteelNetwork.com/

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.

2.2. FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: As indicated on the drawings.
   4. Live load deflection meeting the following, unless otherwise indicated:
      b. Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
   5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.3. FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.

   1. Base Metal: Structural Steel (SS), Grade 33/230.
   2. Gage and Depth: As required to meet specified performance levels.
C. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.4. FASTENERS
   A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
   B. Anchorage Devices: Powder actuated.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that substrate surfaces are ready to receive work.
   B. Verify field measurements and adjust installation as required.

3.2. INSTALLATION OF JOISTS AND PURLINS
   A. Install framing components in accordance with manufacturer's instructions.
   B. Make provisions for erection stresses. Provide temporary alignment and bracing.
   C. Place joists at 12 inches on center; not more than 2 inches from abutting walls, and connect joists to supports using fastener method.
   D. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.
   E. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.
   F. Provide web stiffeners at reaction points.
   G. Touch-up field welds and damaged galvanized surfaces with primer.

END OF SECTION 05 4000
SECTION 05 5000 - METAL FABRICATIONS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Shop fabricated steel items.

1.2. RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.
B. Section 05 5213 - Pipe and Tube Railings.

1.3. REFERENCE STANDARDS

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.1. MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.
B. Plates: ASTM A283/A283M.
C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2. FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3. FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
B. Lintels: As detailed; prime paint finish.

2.4. FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for paint finish.
B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
D. Prime Painting: One coat.
E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
3.2. INSTALLATION
   A. Install items plumb and level, accurately fitted, free from distortion or defects.
   B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
   C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.3. TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
   B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 05 5000
SECTION 05 5100 - METAL STAIRS

PART 1  GENERAL

1.1.  SECTION INCLUDES

A. Prefabricated Alternating Tread Stairs with metal treads.

1.2.  REFERENCE STANDARDS


D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.


K. OSHA 1910.28: Duty to have fall protection and falling object protection.

L. OSHA 1910.29: Fall protection systems and falling object protection-criteria and practices.

M. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3.  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

   2. Include the design engineer's seal and signature on each sheet of shop drawings.

D. Design Data: As required by authorities having jurisdiction.
E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.4. QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
   2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.1. MANUFACTURERS

2.2. METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Dimensions: As indicated on drawings.
   3. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   5. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.3. PREFABRICATED STAIRS

A. Alternating Tread Stairs: Welded metal unit; factory fabricated to the greatest degree possible.
   1. Design Requirements:
      a. Stair Load Capacity: Support the following without exceeding the allowable working stress of the material.
1) Single Point Load: 1000 pounds.
2) Distributed Load: 100 pounds per square foot.

b. Guardrail and Handrail Capacity: Support the following without exceeding the allowable working stress of the material.
   1) Single Point Load: 200 pounds.
   2) Distributed Load: 50 pounds per linear foot.

c. Support the following without exceeding the allowable working stress of the material.
   1) Single Point Load: 1000 pounds.
   2) Distributed Load: 100 pounds per square foot.

   a. Components: Manufacturer's standard handrails, guardrails, non-skid treads and stringers.
   b. Finish: Manufacturer's standard safety yellow powder coat.
   c. Accessories: Manufacturer's standard foot divider with rubber bumper strip.
   d. Performance Standard: Units shall be designed and manufactured to meet or exceed OSHA 1910.25.
   e. Degree of Incline: 60 to 70 degrees.
   f. Components: Ladder, mounting brackets and handrails on both sides.
      1) Ladder Stringer: 5 inches X 2 inches X 3/16 inch (127 mm X 51 mm X 5 mm) extruded 6005-T5 aluminum channel.
      2) Ladder Treads: 5-3/16 inches X 1-1/8 inches X 1/8 inch (131 mm X 29 mm X 3 mm) 1-1/4 inches X 1-1/4 inches X 1-1/4 inches angle welded to underside of treads. Treads shall be welded and bolted to stringer with 1/4 inch (6 mm) stainless steel bolts.
         (a) Tread Material: Extruded 6005-T5 aluminum with serrated slip resistance surface (standard).
      3) Ladder Mounting Brackets:
         (a) Floor Brackets: 2 inches X 3 inches X 1/4 inch (51 mm X 76 mm X 6 mm) aluminum angle.
         (b) Top Bracket: 4-3/4 inches X 5 inches X 1/4 inch (121 mm by 127 mm by 6 mm) aluminum angle.
      4) Handrails: 1-1/4 inches (32 mm) Schedule 40, 6005-T5 aluminum pipe provided with internal aluminum fittings.
      5) Platform:
         (a) Surface: Platforms 9 sf (0.84 sq m) or less shall be made of standard tread material. Platforms larger than 9 sf (0.84 sq m) shall have a bar grating surface.
         (b) Toe Boards: 4 inches X 1/4 inch (102 mm X 6 mm) 6005 T-5 aluminum.
         (c) Handrails: 1-1/4 inches (32 mm) Schedule 40, 6005-T5 aluminum pipe provided with internal aluminum fittings.

3. Manufacturers:
   a. Lapeyre Stair, Inc; Alternating Tread Stair: www.lapeyrestair.com/#sle.
b. Precision Ladders, LLC: www.PrecisionLadders.com

c. O'Keeff's Inc. : www.Okeeffes.com

d. Substitutions: See Section 01 6000 - Product Requirements.

2.4. HANDRAILS AND GUARDS

A. Stringer-Mounted Rails: Round pipe or tube rails unless otherwise indicated.

1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum. Schedule 40, 6005-T5 aluminum pipe provided with internal aluminum fittings.

PART 3  EXECUTION

3.1. EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2. INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION 05 5100
SECTION 06 1000 - ROUGH CARPENTRY

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Structural dimension lumber framing.
B. Exposed timber structural framing.
C. Non-structural dimension lumber framing.
D. Rough opening framing for doors, windows, and roof openings.
E. Sheathing.
F. Preservative treated wood materials.
G. Fire retardant treated wood materials.
H. Miscellaneous framing and sheathing.
I. Concealed wood blocking, nailers, and supports.

1.2. RELATED REQUIREMENTS

A. Section 06 1323 - Heavy Timber Framing.
B. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.3. REFERENCE STANDARDS

B. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
E. SPIB (GR) - Grading Rules; 2014.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials and application instructions.
C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 4by8 inch in size illustrating wood grain, color, and general appearance.

1.5. DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2  PRODUCTS

2.1. GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Lumber fabricated from old growth timber is not permitted.

2.2. DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Southern Pine.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Species: Southern Pine.
   2. Grade: No. 1 & Btr.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.3. EXPOSED TIMBERS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (20 percent maximum).

C. Surfacing: S4S.

D. Species: Redwood.

E. Grade: Clear Heart Structural.
2.4. STRUCTURAL COMPOSITE LUMBER

A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.


2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.


4. Manufacturers:
   a. Boise Cascade Company; ____: www.bc.com/#sle.
   b. Weyerhaeuser Company; ____: www.weyerhaeuser.com/#sle.

2.5. CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.

1. Grade: Structural 1 Sheathing.

2. Bond Classification: Exposure 1.

3. Performance Category: 5/8 PERF CAT.


5. Edges: Square.

6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.

7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.

8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.

9. Manufacturers:
   b. Georgia-Pacific LLC; DryGuard Enhanced OSB sheathing: www.buildgp.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

   1) Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

B. Wall Sheathing: Oriented strand board wood structural panel; PS 2.

1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 5/8 PERF CAT.
5. Edges: Square.
6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
9. Manufacturers:
   b. Georgia-Pacific LLC; Blue Ribbon OSB wall sheathing: www.buildgp.com/#sle.
   c. Weyerhaeuser Company; www.weyerhaeuser.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
      1) Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

2.6. ACCESSORIES

A. Fasteners and Anchors:

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

D. Sill Flashing: As specified in Section 07 6200.

2.7. FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Manufacturers:
   b. Hoover Treated Wood Products, Inc; : www.frtw.com/#sle.
   d. Viance, LLC; D-Blaze:  www.treatedwood.com/#sle.

2. Interior Type A:  AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   b. Treat rough carpentry items as indicated.
   c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Manufacturers:
      c. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with roofing or flashing.
      c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.1. PREPARATION
   A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
   B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
   C. Coordinate installation of rough carpentry members specified in other sections.

3.2. INSTALLATION - GENERAL
   A. Select material sizes to minimize waste.
   B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3. FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4. BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.5. ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.6. INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.
   1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.

3.7. TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.8. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.9. CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 1000
SECTION 06 1323 - HEAVY TIMBER FRAMING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Structural design, fabrication and installation of Heavy structural timber for posts, beams, joists, and purlins.

B. Provide all labor, materials, staging, scaffolding, temporary bracing, crane, hoists, rigging, equipment, and services necessary to perform the Work of this Section. The work includes, but is not necessarily limited to the following:
   1. Timber components of every description, including beams, girts, plates, braces, ties, pegs, webs.
   2. Miscellaneous hardware for heavy timber construction, including but not limited to: Plate connectors and bolts.

C. Connection hardware.

1.2. RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Placement of steel support fabrications.

B. Section 05 1200 - Structural Steel Framing: Steel support fabrications.

C. Section 06 1000 - Rough Carpentry:

1.3. PRICE AND PAYMENT PROCEDURES

A. See Section 012300 - Alternates, for alternates affecting this section.
   1. Alternate #1 for pavilion at south side of site.
   2. Basis of Design Pavilion; Vermont Timber Works; Cadwalader Picnic Pavilion.
      a. Vermont Timber Works, Inc.
         36 Fairbanks Road
         North Springfield, VT 05150
         (802) 886-1917

B. Base bid to include timber frame entry canopy at north side of building.

1.4. REFERENCE STANDARDS

A. AITC 108 - Standard For Heavy Timber Construction; 1993.


D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
F. SPIB (GR) - Grading Rules; 2014.
G. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Shop Drawings: Indicate dimensions, wood species and grades, component profiles, drilled holes, fasteners, connectors, erection details and sequence.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.
   3. Shop Drawings shall include stress analysis and joint design by a practicing registered professional engineer with structural engineering credentials, licensed to practice in the state of Missouri. The Shop Drawings shall bear the seal of the registered professional engineer.
   4. Truss design shall provide the required stability and resistance to gravity loads.
   5. No trusses shall be ordered or fabricated prior to the approval of the Shop Drawings by the Architect.
C. Product Data: Submit data on proprietary connection devices.
D. Product Data: Submit technical data on wood preservative materials, application instructions.
E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
F. Designer's Qualification Statement.
G. Manufacturer's Qualification Statement.

1.6. QUALITY ASSURANCE

A. Designer Qualifications: Design members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
B. Lumber Grading Agency: Certified by American Lumber Standards Committee.
C. Manufacturer Qualifications: Company specializing in manufacture of heavy timber framing, certified by American Institute of Timber Construction, with three years minimum experience.

1.7. MEASUREMENTS

A. The Contractor shall obtain and verify all measurements and conditions at the building as required for the proper installation of his work. He shall be responsible for the accuracy and fit of the various parts of his work and the proper building-in of same.
1.8. PROTECTION, STORAGE AND HANDLING

A. Protect trusses and keep under cover in transit and at the job site. Stack to ensure proper ventilation and drainage. Store under cover in a well ventilated area. Trusses damaged in shipment or at the job site shall be repaired or replaced at no cost to the Owner.

PART 2 PRODUCTS

2.1. WOOD MATERIALS

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.

C. Lumber Grading Rules: SPIB (GR).

D. Timber shall be sized according to engineering requirements. Minimum size shall be 6" x 6" in all directions.

E. Timber species shall be Douglas Fir, Select Structural, S4S Or #1 & Better Douglas Fir, S4S, FOHC or Native Hemlock/Pine, S4S.
   1. Exposed edges shall have a 1/2" wide chamfer (S4S spec).

2.2. ACCESSORIES

A. Furnish and install all necessary hardware and metal shapes required for assembly and erection of the trusses.

B. Connectors: Type weldable steel.
   1. Prime connectors, except where cast in concrete.

C. Bolts, Nuts, Washers, Lags, and Screws, Untreated Wood: Medium carbon steel; galvanized coating per 1; size and type to suit application.

D. Bolts, Nuts, Washers, Lags, and Screws, Preservative-Treated Wood: Stainless steel; size and type to suit application.

E. All steel shapes, plates, and tubes, unless otherwise specified, shall conform to ASTM A-36, as amended to date. Steel pipe shall conform to ASTM 53, Grade B.

F. Where welding is called for, it shall be by the electric arc process in accordance with the American Welding Society's Code for Arc and Gas Welding in Building Construction.

G. All other steel shapes, plates, tubes, etc. shall be thoroughly cleaned and given one heavy shop coat of an approved red lead primer (black), well worked into all joints and open spaces. After erection, touch-up as required. Surfaces which are not accessible for field painting shall have one shop coat of black paint before leaving the shop.

2.3. FABRICATION

A. Fabricate components in accordance with AITC 108, with joints neatly fitted, welded, and ground smooth.
2.4. WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA U1, Use Category UC3B, Commodity Specification A, using waterborne preservative to 0.25 lb/cu ft retention.

B. Trusses shall be prefinished on all surfaces and joints with one coat of Polyurethane for Fir, Minwax or equal for native material.

C. Wood Preservative (Surface Application):

PART 3 EXECUTION

3.1. PREPARATION

A. Ensure that steel support fabrications are installed in correct locations and anchored securely.

3.2. JOINERY

A. Joinery shall be in the best of the early English and early American traditions, designed for strength, shrinkage, checking, and twisting.

1. Metal connections shall not be used unless required by the structural design, and, in those cases, must be concealed and held at an absolute minimum, meeting the Architect's approval. All workmanship shall be of the very highest quality.

2. All joinery shall be accurately cut so as to make a neat, snug fit.

3.3. ERECTION

A. Installation of trusses shall be in accordance with the details and notes on the Drawings, the approved Shop Drawings, code requirements, and the best trade practices.

B. Truss components and assemblies must be checked for dimensions and anchorage accuracy before erection.

C. Temporary bracing and guy lines shall be provided to adequately protect all persons and property and to insure proper alignment.

D. Padding or non-marking slings shall be used, and corners shall be protected with blocking.

E. Set structural members level and plumb, in correct position.

F. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

G. Do not field cut or alter structural members without approval of Architect.

H. All joints that require pegging shall have pegs driven until snug or flush. Pegs shall protrude 1" – 2" on both sides of truss except where they should be flush as directed above. Broken pegs shall be removed and replaced. Pegs with a mushroomed head shall be cut off below that portion.

I. Tools used to drive or pull joints together shall not permanently mar the finished surfaces of the trusses.

J. After erection, touch-up primed surfaces with primer.
3.4. SITE APPLIED WOOD TREATMENT

   A. Brush apply one coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings.

   B. Apply preservative treatment in accordance with manufacturer's instructions.

   C. Treat site-sawn ends.

   D. Allow preservative to cure prior to erecting members.

END OF SECTION 06 1323
SECTION 06 1753 - SHOP-FABRICATED WOOD TRUSSES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Shop fabricated wood trusses for roof and floor framing.
B. Bridging, bracing, and anchorage.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.3. REFERENCE STANDARDS

B. SPIB (GR) - Grading Rules; 2014.

1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.
D. Designer's Qualification Statement.
E. Fabricator's Qualification Statement.

1.5. QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
1.6. DELIVERY, STORAGE, AND HANDLING
   A. Handle and erect trusses in accordance with TPI BCSI 1.
   B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.1. MANUFACTURERS
   A. Truss Plate Connectors:
      4. Eagle Metal; www.eaglemetal.com

2.2. TRUSSES
   A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
      1. Species and Grade: Southern Pine, SPIB (GR) Grade 1.
      2. Structural Design: Comply with applicable code for structural loading criteria.

2.3. MATERIALS
   A. Lumber:
      1. Moisture Content: Between 7 and 9 percent.
      2. Lumber fabricated from old growth timber is not permitted.
   B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
   C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.4. ACCESSORIES
   A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 1000.
   B. Fasteners: Electrogalvanized steel, type to suit application.
   C. Bearing Plates: Electrogalvanized steel.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that supports and openings are ready to receive trusses.
3.2. PREPARATION

A. Coordinate placement of bearing items.

3.3. ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Install permanent bridging and bracing.

D. Install headers and supports to frame openings required.

E. Frame openings between trusses with lumber in accordance with Section 06 1000.

F. Coordinate placement of decking with work of this section.

3.4. TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION 06 1753
SECTION 06 2000 - FINISH CARPENTRY

PART 1  GENERAL

1.1. SECTION INCLUDES
   A. Finish carpentry items.
   B. Wood casings and moldings.
   C. Cellular PVC casing and moldings.
   D. Hardware and attachment accessories.

1.2. RELATED REQUIREMENTS
   A. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.3. REFERENCE STANDARDS
   B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
   D. PS 1 - Structural Plywood; 2009.

1.4. ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.5. SUBMITTALS
   A. See Section 01 3300 - Submittals for submittal procedures.
   B. Product Data:
      1. Provide instructions for attachment hardware and finish hardware.
   C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
      1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
      2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   D. Samples: Submit two samples of wood trim 6 inch long.

1.6. QUALITY ASSURANCE
   A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.1. FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

1. Shall have a flame spread index (FSI) of less than 25 when tested in accordance with ASTM 84, which is a Class A (Class 1) Flame Spread Classification

C. Exterior Woodwork Items:

1. See paragraph 2.4 below for manufacturers and more information.

2. Window Casings, Brick moulds, bead board, Crown moulds, trim and Moldings: Cellular PVC; prepare for paint finish.

D. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.2. WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.3. SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

2.4. ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of pine species.

B. Cellular PVC Trim: Extruded, expanded PVC; UV-resistant, heat-stabilized, and rigid material.

1. Physical Properties: Free foam cellular PVC material with a small-cell microstructure of 0.60 grams/cm³ in accordance with ASTM D 792 with the following physical and performance properties:

2. Density: 31 pounds per cubic foot, minimum.


4. Window Casings, Brick moulds, bead board and Moldings: Cellular PVC; prepare for paint finish.

5. Surface Patterns: Smooth/Smooth and Woodgrain Texture/Smooth.
C. Manufacturers:
1. AZEK Building Products, Inc; Traditional Trim: www.azek.com.

D. Specialty Profile Sizes: Provide the following PVC Millwork Specialty profiles.
1. Trimboard and Sheet Sizes: Millwork Trimboards are available in nominal widths of 3 inches to 16 inches and nominal thickness of 5/8, 1, 5/4 inches. Millwork Sheets are available in 4-foot widths and in lengths of 8, 10, 12, 18, and 20 feet, with actual thickness of 3/8, 1/2, 5/8, 3/4, 1, 1-1/4 inch. Millwork Beadboards are 1/2-inch thick by 5-1/2, 6, 8-1/2 inches wide by 18 feet long. Millwork WP4/Nickel Gap panels are 3/4-inches thick by 6 inches wide by 18 feet long. Millwork Cornerboards are available in a nominal thickness of 5/4 inches and nominal 4-inch and 6-inch outside corner sizes. Lengths available are 10 and 20 feet, and vary by product.
2. PVC Millwork comes in Natural White and does not require painting for protection. Painting is possible with 100% acrylic latex paint with an LRV (light reflective value) of 55 or higher. VinylSafe Technology colors should be used for darker colors with an LRV of 54 or lower.
3. Adhesives:
   a. Glue all trim joints (scarf or miter) with a cellular PVC cement/adhesive such as TrimTight or Extreme PVC TrimWelder.
   b. Glue joints should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
   c. Surfaces to be glued should be smooth, clean and in complete contact with each other.
   d. Various adhesives may be used. Consult adhesive manufacturer to determine suitability.
4. Sealants: Use urethane, polyurethane or acrylic based sealants without silicone as specified in Division 7.
5. Wood Primer: Alkyd primer sealer.
7. Fasteners such as nails and screws shall be stainless steel or hot-dipped galvanized. Fasteners shall be approved box nails or finish wood screws and shall be designed for wood trim and wood siding with a thinner shank. Nails shall have blunt points and full-rounded heads. The fasteners shall be long enough to penetrate the solid wood substrate a minimum of 1-1/2 inches. The fasteners located at board ends shall be placed no more than 3/4 inches from the end of the board.

2.5. FABRICATION
A. Shop assemble work for delivery to site, permitting passage through building openings.
B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.6. SHOP FINISHING
A. Sand work smooth and set exposed nails and screws.
B. Apply wood filler in exposed nail and screw indentations.
C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.
   2. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

E. Prime paint surfaces in contact with cementitious materials.

F. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify adequacy of backing and support framing.
   B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2. INSTALLATION
   A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
   B. Set and secure materials and components in place, plumb and level.
   C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.3. SITE APPLIED WOOD TREATMENT
   A. Apply preservative treatment in accordance with manufacturer's instructions.
   B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.
   C. Allow preservative to dry prior to erecting members.

3.4. PREPARATION FOR SITE FINISHING
   A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
   B. Site Finishing: See Section 09 9000.
C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.5. TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 2000
SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1. SECTION INCLUDES
   A. Specially fabricated cabinet units.
   B. Cabinet hardware.
   C. Preparation for installing utilities.
   D. Wardrobe cabinet mirrors.
   E. Plastic laminate shelving.

1.2. RELATED REQUIREMENTS
   A. Section 08 8000 - Glazing: Glass for casework.
   B. Section 12 3600 - Countertops.

1.3. REFERENCE STANDARDS
   A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
   C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
   D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4. ADMINISTRATIVE REQUIREMENTS
   A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5. SUBMITTALS
   A. See Section 01 3300 - Submittals for submittal procedures.
   B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
      1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
      2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   C. Product Data: Provide data for hardware accessories.
   D. Samples: Submit actual samples of architectural cabinet construction, minimum 8 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
   E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.
1.6. QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.8. FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1. CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:
   2. Finish - Exposed Interior Surfaces: Decorative laminate.
   4. Finish - Concealed Surfaces: Manufacturer's option.
   5. Door and Drawer Front Edge Profiles: Square edge with thick applied band.
   6. Door and Drawer Front Retention Profiles: Fixed panel.
   7. Casework Construction Type: Manufacturer's option.
   8. Interface Style for Cabinet and Door: Style 2 - Finish Inset; flush overlay.
      a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
   10. Cabinet Design Series: As indicated on drawings.
   11. Adjustable Shelf Loading: 50 lbs. per sq. ft.
2.2. WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.3. LAMINATE MATERIALS

A. Manufacturers:

B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

D. Provide specific types as indicated.
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color, finish as indicated.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, color, finish as indicated.
   3. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, color, finish as indicated.

2.4. COUNTERTOPS

A. Countertops are specified in Section 12 3600.

2.5. STORAGE ROOM SHELVING

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color, finish as indicated.

D. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

2.6. ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

C. Resident Room Wardrobe Glassless Mirrors:
   1. Basis of Design Mirrorlite® / Physical Activity Glassless Mirror. www.gomirrorlite.com
   2. Other Acceptable Manufacturers:
      a. Rose Brand; www.rosebrand.com
      b. Dulles Glass & Mirror; www.dullesglassandmirror.com
3. Description: Mirror consists of a rigid foam core framed by an aluminum extrusion. The frame has a raised lip around the four edges. A polyester film, metalized on the backside, is stretched across the raised edges to form the mirror surface. Because the film is mounted on raised edges, an air space is created between the back of the film and the core. This air space, 1/8”, allows the film to flex under minor impact without damage.

4. Size: 16- inches wide x 48-inches high x .75-inches thick.


7. Frame: Aluminum extrusion-nonflammable.

8. Provide unit with pre-drilled holes and mounting kit.

D. Fasteners: Size and type to suit application.

2.7. HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Cabinet Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

C. Adjustable Wall mounted Shelf Supports: Extra duty, double slot back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments. BHMA Grade 2 compliant.

D. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.

E. Sliding Door Pulls: Circular shape for recessed installation, steel with satin finish.

F. Cabinet Locks: As indicated on drawings
   1. Keyed cylinder cam lock, two keys per lock, master keyed, steel with chrome finish.
      a. Product: C3186 5/8" double bitted Cam Lock manufactured by CompX Chicago.
   2. Combination / Keyed cylinder cam lock, two keys per lock, master keyed, steel with polished nickel finish.
      a. Product: Combi-Cam Ultra, 7440S manufactured by Combi-Cam.

G. Catches: Magnetic.

H. Drawer Slides:
   1. Type: Extension types as indicated.
   2. Static Load Capacity: Commercial grade.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
6. Manufacturers:
   b. Grass America Inc; Dynapro: www.grassusa.com/#sle.

   1. Side Type: Double Wall.
   2. Drawer Side Height: 4-3/4 inches.
   3. Drawer Length: 18 inch.
   4. Extension Type: Full extension with overtravel.
   5. Static Load Capacity: Commercial grade.
   7. Stops: Integral type.

J. Hinges: European style concealed self-closing type, steel with satin finish.
   1. Manufacturers:
      b. Hettich America, LP; : www.hettich.com/#sle.
      c. Blum, Inc; : www.blum.com/#sle.

K. Sliding Door Track Assemblies: Upper and lower track of satin anodized aluminum, with matching shoe equipped with nylon rollers.

2.8. FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
   1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
   2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
   1. Provide center matched panels at each elevation.
2. Provide sequence matching across each elevation.
3. Carry figure of cabinet fronts to toe kicks.

F. Mechanically fasten backsplash to countertops as recommended by laminate manufacturer at 16 inches on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

H. Shop glaze glass materials using the Interior Dry method as specified in Section 08 8000.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify adequacy of backing and support framing.
B. Verify location and sizes of utility rough-in associated with work of this section.

3.2. INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
C. Use fixture attachments in concealed locations for wall mounted components.
D. Use concealed joint fasteners to align and secure adjoining cabinet units.
E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
F. Secure cabinets to floor using appropriate angles and anchorages.

3.3. ADJUSTING

A. Adjust installed work.
B. Adjust moving or operating parts to function smoothly and correctly.

3.4. CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 4100
SECTION 06 8316 - FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.2. REFERENCE STANDARDS


1.3. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 4x4 inch in size illustrating material and surface design of panels.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.4. DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:

2.2. PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size:  4 by 8 feet.
   2. Panel Thickness:  0.10 inch.
   5. Attachment Method:  Adhesive only, with trim and sealant in joints.

2.3. MATERIALS

A. Panels:  Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics:  Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance:  Score of 10, when tested in accordance with ASTM D3273.
   3. Scratch Resistance:  Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
   4. Impact Strength:  Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
   6. Biological Resistance:  Rating of 0, when tested in accordance with ISO 846.

B. Trim:  Vinyl; color coordinating with panel.

C. Sealant:  Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.2. INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.
G. Fill channels in trim with sealant before attaching to panel.
H. Install trim with adhesive and screws or nails, as required.
I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 06 8316
SECTION 07 2100 - THERMAL INSULATION

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, and underside of floor slabs.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.5. FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2  PRODUCTS

2.1. MANUFACTURERS

A. Thermal Insulation:

1. Dow Chemical Company.

2. CertainTeed Corporation.

3. Kingspan Insulation LLC.

4. Owens Corning Corporation.
5. Knauf Insulation.
7. Substitutions: See Section 01 6000 - Product Requirements.

2.2. APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.
B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
C. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.3. FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   5. Board Thickness: 1-1/2 inch.
   7. Type and Compressive Resistance: Type XI, 5 psi (35 kPa), minimum.
   8. Type and Water Absorption: Type XI, 4.0 percent by volume, maximum, by total immersion.
   9. Type and Thermal Resistance, R-value: Type XI, 3.1 (0.55) per 1 inch thickness at 75 degrees F mean temperature.

Manufacturers:
   a. AFM Corp; : www.r-control.com/#sle.
   b. Diversifoam Products; : www.diversifoam.com/#sle.
   c. InsulFoam LLC; InsulFoam Below Grade Insulation : www.insulfoam.com/#sle.

B. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   5. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
7. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.

8. Manufacturers:
   b. Kingspan Insulation LLC; GreenGuard XPS TYPE VI 40 PSI: www.trustgreenguard.com/#sle.
   c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.

2.4. BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   5. Thermal Resistance: R-value of 21 minimum or as specified on drawings.
   6. Thickness: 5 1/2 inch minimum or as specified on drawings.
   7. Manufacturers:
      c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.

2.5. ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch thick.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

C. Flashing Tape: Special polyolefin film with high performance adhesive.
   1. Application: Interior window and door sill flashing tape.
   2. Width: Are required for application.
PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2. BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.3. BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at following frequency:

B. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

C. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
2. Full bed 1/8 inch thick.

D. Install boards to fit snugly between wall ties.
   1. Place membrane surface against adhesive.
   2. Place membrane surface facing out, and tape seal board joints.

E. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.
   4. Place impale fastener locking discs.

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4. BOARD INSTALLATION UNDER CONCRETE SLABS
   A. Place insulation under slabs on grade after base for slab has been compacted.
   B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
   C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.5. BATT INSTALLATION
   A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
   B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
   C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
   D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
   E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.
   F. Tape seal tears or cuts in vapor retarder.
   G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.6. PROTECTION
   A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 2100
SECTION 07 2500 - WEATHER BARRIERS

PART 1  GENERAL

1.1.  SECTION INCLUDES

A.  Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.2.  RELATED REQUIREMENTS

A.  Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B.  Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.

C.  Section 07 9200 - Joint Sealants: Sealing building expansion joints.

1.3.  DEFINITIONS

A.  Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B.  Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.4.  REFERENCE STANDARDS


1.5.  SUBMITTALS

A.  See Section 01 3300 - Submittals for submittal procedures.

B.  Product Data: Provide data on material characteristics.

C.  ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D.  Manufacturer's Installation Instructions: Indicate preparation.

E.  ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
1.6. QUALITY ASSURANCE
   A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
      1. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.7. FIELD CONDITIONS
   A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2  PRODUCTS

2.1. WEATHER BARRIER ASSEMBLIES
   A. Air Barrier:
      1. On outside surface of sheathing of exterior walls use air barrier coating.

2.2. AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)
   A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
      1. Air Barrier Membrane:
         b. Dry Film Thickness (DFT) 60 mil, 0.060 inch minimum.
         c. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
         d. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
         e. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to three months of weather exposure.
         f. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
         g. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
         h. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
         i. VOC Content: 100 g per L or less.
         j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
         k. Manufacturers:
            4) W.R. Meadows, Inc; Air-Shield LMP: www.wrmeadows.com/#sle.
5) Substitutions: See Section 01 6000 - Product Requirements.

2.3. ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.


C. Stainless Steel Flashing: Flexible flashing with 8 mil, 0.008 inch thick sheet of Type 304 stainless steel, 8 mil, 0.008 inch of butyl adhesive and a siliconized release liner.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2. PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.3. INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Coatings:

1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.

2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.

3. Use flashing to seal to adjacent construction and to bridge joints.

D. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.

3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.

4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.

6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.4. PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07 2500
SECTION 07 3113 - ASPHALT SHINGLES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Asphalt shingle roofing.
B. Flexible sheet membranes for eave protection, underlayment, and valley protection.
C. Associated metal flashings and accessories.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Roof sheathing.
B. Section 07 6200 - Sheet Metal Flashing and Trim: Edge and cap flashings.

1.3. REFERENCE STANDARDS

I. NRCA (RM) - The NRCA Roofing Manual; 2018.
J. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data indicating material characteristics.
C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.
D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.
E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5. QUALITY ASSURANCE

A. Products are Required to Comply with Fire Resistance Criteria: UL (DIR) listed and labeled.

1.6. FIELD CONDITIONS

A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

1.7. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Algae Resistant Asphalt Shingles:

2.2. ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
   2. Wind Resistance: Class F, 110-mph when tested in accordance with ASTM D3161/D3161M.
   3. Warranted Wind Speed: Not greater than 130 mph.
   4. Algae Resistant.
   5. Weight: 229 / 240 lb/100 sq ft.
   7. Style: Architectural to match existing.

2.3. SHEET MATERIALS

A. Eave Protection Membrane:
   2. Slip resistant top surface in accordance with ASTMD1984
   3. Provide products from same manufacturer as asphalt shingles to ensure roof weathertight warranty requirements are met.
4. Manufacturers:
   b. GAF: Storm Guard Film -Surfaced Leak Barrier. www.gaf.com/#sle.
   c. Owens Corning Corp; WeatherLock Flex: www.owenscorning.com/#sle.

B. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
   1. Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
   4. Flammability: Minimum of Class A, when tested in accordance with ASTM E108.
   5. Ultraviolet (UV) Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of six months.
   7. Water Vapor Permeance: Vapor retarder; maximum of 1 perm, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
   8. Fasteners: Plastic cap nails as recommended by manufacturer or building code qualification report or approval.
   9. Manufacturers:
      c. Owens Corning Corp; Pro Armor: www.owenscorning.com/#sle.
      d. System Components Corporation, Inc; ProTex: www.systemcomponents.net/#sle.

   1. Manufacturers:
      a. Same material and manufacturers as eave protection membrane

2.4. ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and conforming to ASTM F1667.


C. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.

D. Plastic Ridge Vents: Extruded plastic with vent openings that do not permit direct water or weather entry; flanged to receive shingles.
2.5. METAL FLASHINGS

A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, dormer flashing, and other flashing indicated.

1. Form flashings to profiles indicated on drawings.
2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
3. Hem exposed edges of flashings minimum 1/4 inch on underside.

B. Steel Sheet Metal: Prefinished and galvanized steel sheet, 26 gage, 0.0179 inch minimum thickness, G90/Z275 hot-dipped galvanized; PVC coated, color as selected.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify existing conditions prior to beginning work.
B. Verify that roof deck is of sufficient thickness to accept fasteners.
C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.
D. Verify roof openings are correctly framed.
E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2. PREPARATION

A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
C. Broom clean deck surfaces before installing underlayment or eave protection.
D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced 6 inches on center.

3.3. INSTALLATION - EAVE PROTECTION MEMBRANE

A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.
B. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

3.4. INSTALLATION - UNDERLAYMENT

A. Underlayment At Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.
B. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.
3.5. INSTALLATION - VALLEY PROTECTION

A. Install one ply of self-adhered flexible flashing, minimum 36 inches wide, centered over valleys.

B. Install flexible flashing in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

C. Weather lap joints minimum 2 inches.

D. At Exposed Valleys: Install one layer of sheet metal flashing, minimum 24 inches wide, centered over open valley and crimped to guide water flow, weather lap joints minimum 2 inch wide band of lap cement along each edge of first layer, press roll roofing into cement, nail in place minimum 18 inches on center and 1 inch from edges.

3.6. INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

B. Secure in place with nails at 6 inches on center, and conceal fastenings.

C. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.7. INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

   1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.

   2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch beyond fascia boards.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Cap hips with individual shingles, maintaining 5 inch weather exposure, and place to avoid exposed nails.

F. After installation, place one daub of plastic cement, one inch diameter under each individual shingle tab exposed to weather, to prevent lifting.

G. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.

H. Complete installation to provide weather tight service.

3.8. PROTECTION

A. Do not permit traffic over finished roof surface.

END OF SECTION 07 3113
SECTION 07 4646 - FIBER-CEMENT SIDING

PART 1 GENERAL

1.1. SECTION INCLUDES
A. Fiber-cement siding and trim

1.2. RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Siding substrate.

1.3. REFERENCE STANDARDS

1.4. SUBMITTALS
A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.
C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
D. Samples: Submit two samples of each siding color indicating color range and finish texture; for color selection.
E. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
F. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.5. QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.6. DELIVERY, STORAGE, AND HANDLING
A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.7. WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
PART 2 PRODUCTS

2.1. FIBER-CEMENT SIDING

A. Lap Siding (Exterior Use): Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

2. Texture: Smooth.
3. Length: 12 ft, nominal.
4. Width (Height): 5-1/4 inches.
5. Thickness: 5/16 inch, nominal.
7. Color: As selected by Architect from manufacturers full range of available colors.
8. Warranty: 30 year limited; transferable.
9. Manufacturers:
   a. Allura, a division of Plycem USA, Inc; : www.allurausa.com/#sle.
   c. Nichiha USA, Inc; : www.nichiha.com/#sle.

B. Lap Siding (SID-1, SID-3): Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

2. Texture: Smooth.
3. Length: 12 ft, nominal.
4. Width (Height): 8-1/4 inches.
5. Thickness: 5/16 inch, nominal.
7. Color: As selected by Architect from manufacturers full range of available colors.
8. Warranty: 30 year limited; transferable.
9. Manufacturers:
   a. Allura, a division of Plycem USA, Inc; : www.allurausa.com/#sle.
   c. Nichiha USA, Inc; : www.nichiha.com/#sle.

C. Shingle Panels: Panels giving appearance of multiple shingles made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

1. Style: Random width, staggered edge.
2. Texture: Wood grain textured.
3. Length: 48 inches.
5. Thickness: 1/4 inch, nominal.
7. Color: As selected by Architect from manufacturers full range of available colors.
8. Warranty: 30 year limited; transferable.
9. Manufacturers:
   a. Allura, a division of Plycem USA, Inc; ______: www.allurausa.com/#sle.
   b. James Hardie Building Products, Inc; ______: www.jameshardie.com/#sle.
   c. Nichiha USA, Inc; ______: www.nichiha.com/#sle.

2.2. ACCESSORIES

A. Trim: Same material and texture as siding.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

C. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

PART 3 EXECUTION

3.1. EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

A. Install Sheet Metal Flashing:
   1. Above door and window trim and casings.
   2. Above horizontal trim in field of siding.

3.3. INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
3. Use trim details indicated on drawings.
4. Touch up field cut edges before installing.
5. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

E. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

F. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.4. PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 4646
SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Field fabricated roof curbs.

B. Section 07 3113 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.

C. Section 07 4646 - Fiber Cement Siding: Flashings at roof to siding transitions.

D. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.3. REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Product Data: Indicate product material and factory paint finish.

D. Samples: Submit two samples 4 x 4 inch in size illustrating metal finish color.
1.5. QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard
details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of
documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets
to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   2. OMG Roofing Products; : www.omgroofing.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2. SHEET MATERIALS

A. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; anodized finish of color as
   selected.

B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop
   pre-coated with modified silicone coating.
   1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked
      enamel finish system.
   2. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally
      cured fluoropolymer finish system.
   3. Color: As selected by Architect from manufacturer's standard colors.

2.3. FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed
   lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.
2.4. GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA (ASMM), Rectangular profile.
B. Downspouts: Rectangular profile.
C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).
D. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
E. Downspout Boots: Steel.
F. Seal metal joints.

2.5. ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.
B. Primer: Zinc chromate type.
C. Concealed Sealants: Non-curing butyl sealant.
D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2. INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
B. Apply plastic cement compound between metal flashings and felt flashings.
C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
D. Seal metal joints watertight.
E. Secure gutters and downspouts in place with concealed fasteners.
F. Slope gutters 1/4 inch per 10 feet, minimum.
G. Connect downspouts to downspout boots, and grout connection watertight.
H. Set splash pads under downspouts.
3.3. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION 07 6200
SECTION 07 8400 - FIRESTOPPING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2. RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.3. REFERENCE STANDARDS


E. ITS (DIR) - Directory of Listed Products; current edition.


I. UL (DIR) - Online Certifications Directory; Current Edition.


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Installer Qualification: Submit qualification statements for installing mechanics.

1.5. QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Firestopping Manufacturers:

1. 3M Fire Protection Products; www.3m.com/firestop/#sle.


2.2. MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. Fire Ratings: Refer to drawings for required systems and ratings.

2.3. FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.

B. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
2.  Air Leakage: Provide systems that have been tested to show L Rating as indicated.
3.  Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.4. FIRESTOPPING FOR PERIMETER CONTAINMENT

2.5. FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
   1. 2 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.
   2. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   3. 1 Hour Construction: UL System W-L-0032; Specified Technologies Inc. FP Intumescent Firestop Plug.
   4. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:
   1. Multiple Penetrations in Large Openings:
      a. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 2 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-1042; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
      b. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-2074; Specified Technologies Inc. SSC collars.
      b. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   4. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.
      b. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
      c. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   5. HVAC Ducts, Insulated:
      a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 2 Hour Construction: UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
2.6. FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2. PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.3. INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.

C. Do not cover installed firestopping until inspected by authorities having jurisdiction.

D. Install labeling required by code.

3.4. CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.5. PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07 8400
SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Nonsag gunnable joint sealants.
B. Self-leveling pourable joint sealants.
C. Joint backings and accessories.

1.2. RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
B. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.
C. Section 07 8400 - Firestopping: Firestopping sealants.
D. Section 08 8000 - Glazing: Glazing sealants and accessories.
E. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.
F. Section 23 3100 - HVAC Ducts and Casings: Duct sealants.

1.3. REFERENCE STANDARDS

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.5. QUALITY ASSURANCE

1.6. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.


B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.

4. QUIKRETE Companies; : www.quikrete.com/#sle.

2.2. JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. Other joints indicated below.
3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Type S-1 - Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
   1. Type S-5 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
   2. Type SL-1 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Type S-4 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Type S-2 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; clear or white verify with Architect.
2. Type S-3 - Interior masonry control joints
3. Type SL-2 - Narrow Control Joints in Interior Concrete Slabs: Self-leveling polyurethane sealant.

D. Type S-2 - Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, food processing areas, and; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.3. JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: As indicated on drawings.

2.4. NONSAG JOINT SEALANTS

A. Type S-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: +100/-50, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   5. Color: To be selected by Architect from manufacturer's standard range.
   6. Cure Type: Single-component, neutral moisture curing.
   7. Service Temperature Range: Minus 65 to 180 degrees F.
   8. Manufacturers:

B. Type S-2 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   2. Manufacturers:
      d. DAP; Dynaflex Ultra.
      e. Substitutions: See Section 01 6000 - Product Requirements.
C. Type S-3 - Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Hardness Range: 20 to 40, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Manufacturers:
      c. Tremco Commercial Sealants and Waterproofing; Dymonic FC: www.tremcosealants.com/#sle.

D. Type S-4 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Manufacturers:
      e. Substitutions: See Section 01 6000 - Product Requirements.

E. Type S-5 - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
   1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
   2. Color: Match adjacent finished surfaces.
   3. Service Temperature Range: Minus 13 to 180 degrees F.
   4. Manufacturers:
      c. DAP Products Inc; Butyl-Flex Sealant: www.dapspecline.com/#sle.
2.5.  SELF-LEVELING SEALANTS

A. Type SL-1 - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.

2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
   d. Tremco Commercial Sealants & Waterproofing; Vulkem 45 SSL: www.tremcosanleants.com/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements.

B. Type SL-2 - Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.

1. Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.

2.6.  ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
3. Manufacturers:
   c. Foam N More, Inc.
   d. R.W. sidley, Inc.
   e. Substitutions: See Section 01 6000 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that joints are ready to receive work.
B. Verify that backing materials are compatible with sealants.
C. Verify that backer rods are of the correct size.

3.2. PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3. INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Perform acoustical sealant application work in accordance with ASTM C919.
D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
E. Install bond breaker backing tape where backer rod cannot be used.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION 07 9200
SECTION 080671 – DOOR HARDWARE SETS

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 references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Sections “Flush and Clad Wood Doors”.
3. Division 08 Section “Aluminum Framed Entrances and Storefronts”.
4. Division 08 Section “Door Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.
1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service
representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the applicable model building code.

F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a
hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.

1. Section 08 71 00 – Door Hardware.

D. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. AD - Adams Rite
5. YA - Yale
6. RF - Rixson
7. NO - Norton
8. MC - Medeco
9. SU - Securitron
10. LU - Lund Equipment Co
11. OT - OTHER

### Hardware Sets

**Set: 1.0**

<table>
<thead>
<tr>
<th>Hardware Type</th>
<th>Code Details</th>
<th>Supplier Abbreviation</th>
<th>Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Hinge</td>
<td>CFM_HD1 x Length Required</td>
<td>PE</td>
<td>087100</td>
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<tr>
<td>Rim Exit Device (NL, CD)</td>
<td>7255 121NL 1220</td>
<td>YA</td>
<td>087100</td>
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<td>087100</td>
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<td>Blade Stop</td>
<td>891</td>
<td>YA</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>Drop Plate</td>
<td>488</td>
<td>YA</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>Surface Closer</td>
<td>UNI4400 299 293S 6190</td>
<td>YA</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>273x224AFGT x Length Required x</td>
<td>PE</td>
<td>087100</td>
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<tr>
<td>Rain Guard</td>
<td>346C x Width of Frame Head</td>
<td>PE</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>Sweep</td>
<td>3452CNB x Length Required</td>
<td>PE</td>
<td>087100</td>
<td></td>
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<tr>
<td>Position Switch</td>
<td>DPS2 - M / W-BK</td>
<td>SU</td>
<td>087100</td>
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**Notes:** System Operational Narrative:
*Door position switch provides open/closed monitoring to both access control system and intrusion alarm service.*

### Set: 2.0

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>Door position switch</td>
<td>Provides open/closed monitoring to both access control system and intrusion alarm service.</td>
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<tr>
<td>Doors</td>
<td>A222B, A223, P003</td>
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<td>3 Hinge (heavy weight)</td>
<td>T4A3386 NRP US32D MK 087100</td>
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<td>1 Classroom Lock</td>
<td>AU 5408LN 497 1220 626 YA 087100</td>
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<td></td>
</tr>
<tr>
<td>1 Core</td>
<td>1220 CGMK 626 YA 087100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Surface Closer</td>
<td>UNI4400 689 YA 087100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Kick Plate</td>
<td>K1050 10&quot; high BEV CSK US32D RO 087100</td>
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<td>1 Gasketing</td>
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<tr>
<td>1 Rain Guard</td>
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<td>1 Sweep</td>
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<tr>
<td>1 Position Switch</td>
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</tbody>
</table>

**Notes:** Operation Description: Door position Switch will notify access control panel of the doors open/closed status.

### Set: 3.0

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Finish</th>
<th>Code</th>
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<tbody>
<tr>
<td>Doors</td>
<td>039</td>
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<tr>
<td>2 Continuous Hinge</td>
<td>MCK-12HD CL MK 087100</td>
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<td>1 Dust Proof Strike</td>
<td>570 US26D RO 087100</td>
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<td>2 Flush Bolt</td>
<td>555 / 557 (As Required) US26D RO 087100</td>
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<tr>
<td>1 Mortise Deadlock</td>
<td>MS1850S 628 AD 087100</td>
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</tr>
<tr>
<td>1 Thumb Turn Cylinder</td>
<td>4066 130 AD 087100</td>
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<td></td>
</tr>
<tr>
<td>1 Core</td>
<td>1220 CGMK 626 YA 087100</td>
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<td></td>
</tr>
<tr>
<td>1 Cylinder</td>
<td>as required US26D YA 087100</td>
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<td></td>
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<tr>
<td>2 Push Bar &amp; Pull</td>
<td>BF15847 Mtg-Type 5HD/12XHD 32D-316 RO 087100</td>
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<tr>
<td>2 Conc Overhead Stop</td>
<td>6-X36 630 RF 087100</td>
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<td></td>
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<tr>
<td>2 Surface Closer</td>
<td>4400 299 293S 689 YA 087100</td>
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<tr>
<td>2 Drop Plate</td>
<td>488 689 YA 087100</td>
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**Notes:** Weatherstrip by Aluminum Door Manufacturer.

### Set: 4.0

<table>
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<tr>
<th>Item</th>
<th>Specification</th>
<th>Finish</th>
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<td>Doors</td>
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<tr>
<td>1 Continuous Hinge</td>
<td>MCK-12HD CL MK 087100</td>
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<td>1 Mortise Deadlock</td>
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<tr>
<td>1 Thumb Turn Cylinder</td>
<td>4066 130 AD 087100</td>
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<tr>
<td>1 Core</td>
<td>1220 CGMK 626 YA 087100</td>
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UPGRADES AND RENOVATIONS CAPE GIRARDEAU VETERANS HOME
U1805-01
FAI 29-043
FGI PROJECT NO: 0180821.00

DOOR HARDWARE SETS

Notes: Weatherstrip by Aluminum Door Manufacturer.

Set: 5.0

Doors: 045, 046

1 Cylinder as required US26D YA 087100
1 Push Bar & Pull BF15847 Mtg-Type 5HD/12XHD 32D-316 RO 087100
1 Conc Overhead Stop 6-X36 630 RF 087100
1 Surface Closer 4400 299 293S 689 YA 087100
1 Drop Plate 488 689 YA 087100

Set: 5.1

Doors: P004

1 Hinge (heavy weight) T4A3786 NRP US26D MK 087100
1 Fire Rated SVR Exit Device (EO) 7110F x EO 626 YA 087100
1 SVR Exit Device (STRM, CD) 7115 AU627F 1220 626 YA 087100
2 Core 1220 CGMK 626 YA 087100
2 Surface Closer 4400 (Reg/PA arm as required) 689 YA 087100
2 Kick Plate K1050 10" high BEV CSK US32D RO 087100
2 Door Stop 403 (or) 441CU (As Required) US26D RO 087100
1 Gasketing S88D (Head & Jambs) PE 087100
1 Astragal S771C x Door Height PE 087100

Set: 6.0

Doors: 043

1 Hinge (heavy weight) T4A3786 NRP US26D MK 087100
2 Magnetic Lock MAG-SAM-1224VDC US32D GS 084126
2 Fire Rated SVR Exit Device (EO) 7110F x EO 626 YA 087100
2 Surface Closer 4400 DE 689 YA 087100
2 Kick Plate K1050 10" high BEV CSK US32D RO 087100
1 Gasketing S88D (Head & Jambs) PE 087100
1 Astragal S771C x Door Height PE 087100

080671 - 7
UPGRADES AND RENOVATIONS CAPE GIRARDEAU VETERANS HOME
FAI 29-043

DOOR HARDWARE SETS

2 Card Reader
   By Security Supplier
2 ElectroLynx Harness
   QC-C1500P MK 087100
1 Power Supply
   BPS (Size & Type as Required) SU 087100
1 Wiring Diagram
   Elevation and Point to Point as Specified OT

Notes: Operation Description:
Doors are normally closed and locked by magnetic shear locks.
An authorized card read on either side of the opening will release the magnetic locks to allow entry or egress.
Magnetic lock are Fail Safe and will be released for free egress in the event of a fire alarm or power outage.

Set: 7.0
Doors: A222A

6 Hinge (heavy weight) T4A3786 US26D MK 087100
2 SVR Exit Device (EO) 7110 x EO 626 YA 087100
2 Surface Closer 4400 DE 689 YA 087100
2 Kick Plate K1050 10" high BEV CSK US32D RO 087100
2 Electromagnetic Holder 998 x Voltage as Required 689 RF 087400
1 Gasketing S88D (Head & Jambs) PE 087100
1 Astragal S771C x Door Height PE 087100

Notes: Doors are magnetically held open. Integrate with fire alarm system to release upon fire alarm activation.

Set: 8.0
Doors: 018, 040, 044, A100, A200, A300, B100, B200, B300, C001, C100, C200, C300

6 Hinge (heavy weight) T4A3786 US26D MK 087100
2 Fire Rated SVR Exit Device (EO) 7110F x EO 626 YA 087100
2 Surface Closer 4400 DE 689 YA 087100
2 Kick Plate K1050 10" high BEV CSK US32D RO 087100
2 Electromagnetic Holder 998 x Voltage as Required 689 RF 087400
1 Gasketing S88D (Head & Jambs) PE 087100
1 Astragal S771C x Door Height PE 087100

Notes: Doors are magnetically held open. Integrate with fire alarm system to release upon fire alarm activation.

Set: 9.0
Doors: 041

3 Hinge (heavy weight) T4A3786 US26D MK 087100
<table>
<thead>
<tr>
<th>Hardware Set</th>
<th>Access Control Cyl Lock</th>
<th>Core</th>
<th>Surf Overhead Stop</th>
<th>Surface Closer</th>
<th>Kick Plate</th>
<th>Silencer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AU NTB620-ZW2 497 1210</td>
<td>1220 CGMK</td>
<td>10-X36</td>
<td>7500</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>608</td>
</tr>
<tr>
<td>1</td>
<td>YA 281300</td>
<td>YA 087100</td>
<td>RF 087100</td>
<td>RO 087100</td>
<td>US32D RO 087100</td>
<td>RO 087100</td>
</tr>
</tbody>
</table>

Notes: System Operational Narrative:
- Door normally closed and secure.
- Access by valid digital code entered into keypad integrated into lockset unlocking lever trim for a predetermined time limit and then relocking.
- Egress always free for immediate exit.
- Door position switch provides open/closed monitoring to both access control system and intrusion alarm service.
- Outside lever trim remains locked (fail secure) in event of power loss. (Lock is battery powered)
Key override cylinder for emergency access.

**Set: 10.0**

Doors: 048, 053, A013, B008, C013

<table>
<thead>
<tr>
<th>Hardware Set</th>
<th>Hinge (heavy weight)</th>
<th>Storeroom Lock</th>
<th>Core</th>
<th>Surf Overhead Stop</th>
<th>Surface Closer</th>
<th>Kick Plate</th>
<th>Door Stop</th>
<th>Silencer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>T4A3786 NRP</td>
<td>AU 5405LN 497 1220</td>
<td>1220 CGMK</td>
<td>4400 (Reg/PA arm as required)</td>
<td>7500</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>403 (or) 441CU (As Required)</td>
<td>608</td>
</tr>
<tr>
<td></td>
<td>US26D MK 087100</td>
<td>626 YA 087100</td>
<td>626 YA 087100</td>
<td>689 YA 087100</td>
<td>689 NO 087100</td>
<td>US32D RO 087100</td>
<td>US26D RO 087100</td>
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</table>

**Set: 11.0**

Doors: 042, 71

<table>
<thead>
<tr>
<th>Hardware Set</th>
<th>Hinge</th>
<th>Storeroom Lock</th>
<th>Core</th>
<th>Surf Overhead Stop</th>
<th>Surface Closer</th>
<th>Kick Plate</th>
<th>Door Stop</th>
<th>Silencer</th>
</tr>
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<tbody>
<tr>
<td>3</td>
<td>TA2714 NRP</td>
<td>AU 5405LN 497 1220</td>
<td>1220 CGMK</td>
<td>10-X36</td>
<td>7500</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>608</td>
<td></td>
</tr>
<tr>
<td></td>
<td>US26D MK 087100</td>
<td>626 YA 087100</td>
<td>626 YA 087100</td>
<td>630 RF 087100</td>
<td>689 NO 087100</td>
<td>US32D RO 087100</td>
<td>US26D RO 087100</td>
<td></td>
</tr>
</tbody>
</table>

**Set: 12.0**

Doors: 003, 006, 007, 008, 014, 021, 022, 023, 033

<table>
<thead>
<tr>
<th>Hardware Set</th>
<th>Hinge</th>
<th>Entry/Office Lock</th>
<th>Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>TA2714</td>
<td>AU 5407LN 497 1220</td>
<td>1220 CGMK</td>
</tr>
<tr>
<td></td>
<td>US26D MK 087100</td>
<td>626 YA 087100</td>
<td>626 YA 087100</td>
</tr>
<tr>
<td>Hardware Set</td>
<td>Description</td>
<td>Model</td>
<td>Finish</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>13.0</td>
<td>Door Stop</td>
<td>403</td>
<td>US26D</td>
</tr>
<tr>
<td>13.0</td>
<td>Silencer</td>
<td>608</td>
<td>RO</td>
</tr>
<tr>
<td></td>
<td>Hinge</td>
<td>TA2714</td>
<td>US26D</td>
</tr>
<tr>
<td></td>
<td>Entry/Office Lock</td>
<td>AU 5407LN 497 1220</td>
<td>626</td>
</tr>
<tr>
<td></td>
<td>Core</td>
<td>1220 CGMK</td>
<td>626</td>
</tr>
<tr>
<td></td>
<td>Surf Overhead Stop</td>
<td>10-X36</td>
<td>630</td>
</tr>
<tr>
<td></td>
<td>Kick Plate</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>689</td>
</tr>
<tr>
<td></td>
<td>Silencer</td>
<td>608</td>
<td>RO</td>
</tr>
<tr>
<td>14.0</td>
<td>Hinge</td>
<td>TA2714</td>
<td>US26D</td>
</tr>
<tr>
<td>14.0</td>
<td>Dust Proof Strike</td>
<td>570</td>
<td>US26D</td>
</tr>
<tr>
<td>14.0</td>
<td>Flush Bolt</td>
<td>555 / 557 (As Required)</td>
<td>US26D</td>
</tr>
<tr>
<td>14.0</td>
<td>Classroom Lock</td>
<td>AU 5408LN 497 1220</td>
<td>626</td>
</tr>
<tr>
<td>14.0</td>
<td>Core</td>
<td>1220 CGMK</td>
<td>626</td>
</tr>
<tr>
<td>14.0</td>
<td>Surf Overhead Stop</td>
<td>10-X36</td>
<td>630</td>
</tr>
<tr>
<td>14.0</td>
<td>Surface Closer</td>
<td>4400 (Reg/PA arm as required)</td>
<td>689</td>
</tr>
<tr>
<td>14.0</td>
<td>Silencer</td>
<td>608</td>
<td>RO</td>
</tr>
<tr>
<td>15.0</td>
<td>Hinge</td>
<td>TA2714</td>
<td>US26D</td>
</tr>
<tr>
<td>15.0</td>
<td>Classroom Lock</td>
<td>AU 5408LN 497 1220</td>
<td>626</td>
</tr>
<tr>
<td>15.0</td>
<td>Core</td>
<td>1220 CGMK</td>
<td>626</td>
</tr>
<tr>
<td>15.0</td>
<td>Door Stop</td>
<td>403 (or) 441CU (As Required)</td>
<td>US26D</td>
</tr>
<tr>
<td>15.0</td>
<td>Silencer</td>
<td>608</td>
<td>RO</td>
</tr>
<tr>
<td>16.0</td>
<td>Hinge</td>
<td>TA2714 NRP</td>
<td>US26D</td>
</tr>
<tr>
<td>16.0</td>
<td>Classroom Lock</td>
<td>AU 5408LN 497 1220</td>
<td>626</td>
</tr>
<tr>
<td>16.0</td>
<td>Core</td>
<td>1220 CGMK</td>
<td>626</td>
</tr>
<tr>
<td>16.0</td>
<td>Surface Closer</td>
<td>4400 (Reg/PA arm as required)</td>
<td>689</td>
</tr>
<tr>
<td>16.0</td>
<td>Kick Plate</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>US32D</td>
</tr>
<tr>
<td>16.0</td>
<td>Door Stop</td>
<td>403 (or) 441CU (As Required)</td>
<td>US26D</td>
</tr>
<tr>
<td>16.0</td>
<td>Silencer</td>
<td>608</td>
<td>RO</td>
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</table>
### Set: 17.0

Doors: 024

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
<th>Set/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Hinge</td>
<td>TA2714</td>
<td>US26D MK 087100</td>
</tr>
<tr>
<td>1 Dust Proof Strike</td>
<td>570</td>
<td>US26D RO 087100</td>
</tr>
<tr>
<td>2 Flush Bolt</td>
<td>555 / 557 (As Required)</td>
<td>US26D RO 087100</td>
</tr>
<tr>
<td>1 Passage Set</td>
<td>AU 5401LN</td>
<td>626 YA 087100</td>
</tr>
<tr>
<td>1 Core</td>
<td>1220 CGMK</td>
<td>626 YA 087100</td>
</tr>
<tr>
<td>2 Surf Overhead Stop</td>
<td>10-X36</td>
<td>630 RF 087100</td>
</tr>
<tr>
<td>2 Silencer</td>
<td>608</td>
<td>RO 087100</td>
</tr>
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</table>

### Set: 18.0


<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
<th>Set/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hinge (heavy weight)</td>
<td>T4A3786</td>
<td>US26D MK 087100</td>
</tr>
<tr>
<td>1 Door Stop</td>
<td>AU 5401LN</td>
<td>626 YA 087100</td>
</tr>
<tr>
<td>1 Silencer</td>
<td>608</td>
<td>RO 087100</td>
</tr>
</tbody>
</table>

### Set: 19.0

Doors: A206, A208, A219, A221, B106, B108, B206, B208, C214, C216, C314, C316

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
<th>Set/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hinge</td>
<td>TA2714</td>
<td>US26D MK 087100</td>
</tr>
<tr>
<td>1 Passage Set</td>
<td>AU 5401LN</td>
<td>626 YA 087100</td>
</tr>
<tr>
<td>1 Surf Overhead Stop</td>
<td>10-X36</td>
<td>630 RF 087100</td>
</tr>
<tr>
<td>3 Silencer</td>
<td>608</td>
<td>RO 087100</td>
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</table>

### Set: 20.0

Doors: 038

<table>
<thead>
<tr>
<th>Item</th>
<th>Code</th>
<th>Set/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hinge</td>
<td>TA2714</td>
<td>US26D MK 087100</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Set No.</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Passage Set</td>
<td>AU 5401LN</td>
<td></td>
</tr>
<tr>
<td>Surface Closer</td>
<td>4400 (Reg/PA arm as required)</td>
<td></td>
</tr>
<tr>
<td>Kick Plate</td>
<td>K1050 10&quot; high BEV CSK</td>
<td></td>
</tr>
<tr>
<td>Door Stop</td>
<td>403 (or) 441CU (As Required)</td>
<td></td>
</tr>
<tr>
<td>Silencer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set: 21.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doors: 047A, 047B</td>
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<td></td>
</tr>
<tr>
<td>Hinge (heavy weight)</td>
<td>T4A3786</td>
<td>US26D</td>
</tr>
<tr>
<td>Push Plate</td>
<td>70C-RKW</td>
<td>US32D</td>
</tr>
<tr>
<td>Pull Plate</td>
<td>110x70C</td>
<td>US32D</td>
</tr>
<tr>
<td>Surface Closer</td>
<td>4430T</td>
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</tr>
<tr>
<td>Kick Plate</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>US32D</td>
</tr>
<tr>
<td>Silencer</td>
<td>608</td>
<td></td>
</tr>
<tr>
<td>Set: 21.1</td>
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<td></td>
</tr>
<tr>
<td>Doors: P001, P002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hinge (heavy weight)</td>
<td>T4A3386 NRP</td>
<td>US32D</td>
</tr>
<tr>
<td>Deadbolt (Classroom)</td>
<td>D161 1220</td>
<td>626</td>
</tr>
<tr>
<td>Privacy Set</td>
<td>AU 5402LN 497</td>
<td>626</td>
</tr>
<tr>
<td>Core</td>
<td>1220 CGMK</td>
<td>626</td>
</tr>
<tr>
<td>Surface Closer</td>
<td>UNI4400</td>
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</tr>
<tr>
<td>Kick Plate</td>
<td>K1050 10&quot; high BEV CSK</td>
<td>US32D</td>
</tr>
<tr>
<td>Threshold</td>
<td>273x224AFGT x Length Required x</td>
<td>PE</td>
</tr>
<tr>
<td>Gasketing</td>
<td>303AS (Head &amp; Jambs)</td>
<td>PE</td>
</tr>
<tr>
<td>Rain Guard</td>
<td>346C x Width of Frame Head</td>
<td>PE</td>
</tr>
<tr>
<td>Sweep</td>
<td>3452CNB x Length Required</td>
<td>PE</td>
</tr>
<tr>
<td>Set: 22.0</td>
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<tr>
<td>Doors: 001A, 001B</td>
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<td></td>
</tr>
<tr>
<td>Cylinder</td>
<td>as required</td>
<td>US26D</td>
</tr>
<tr>
<td></td>
<td>All Hardware Provided By Door Supplier</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Door is Push/Push. No Locking function.

Set: 23.0

Doors: 044

| Track System                | W60 x Length Required                | PE       | 1        | 087100      |                            |
1 Door Pull | BF 110 Mtg-Type 5 | US32D | RO | 087100

**Set: 24.0**

Doors: 050B, P013

2 Track System | W60 x Length Required | PE | 087100

4 Door Pull | BF 110 Mtg-Type 5 | US32D | RO | 087100

**Set: 30.0**

1 Key Management System | EA-100117 | MC | 087100

1 Key Cabinet | 1200 Series (capacity as required) | LU

END OF SECTION 080671
SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Standard and custom hollow metal doors and frames.
   2. Steel sidelight, borrowed lite and transom frames.
   3. Light frames and glazing installed in hollow metal doors.

B. Related Sections:
   1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
   2. Division 08 Section "Flush Wood Doors".
   3. Division 08 Section "Clad Wood Doors".
   4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
   5. Division 08 Section "Door Hardware".
   6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
   6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
17. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
18. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of anchorages, joints, field splices, and connections.
   6. Details of accessories.
   7. Details of moldings, removable stops, and glazing.
   8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:
   1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

E. Warranty: Provide sample of manufacturer’s warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.
   1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

   a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
   1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
      a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.29, R-Value 3.4, including insulated door, thermal-break frame and threshold.
   2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
      a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, and ANSI/SDI A250.4 for physical performance level.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.
a. Provide 18 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.

b. Thermal properties to rate at a fully operable minimum U-Factor 0.374 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.

c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.378 and R-Value 2.5, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.

4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).

5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.

6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".

7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

   a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.

3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.

4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.

5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 797 Mercury Series.
3. Ceco Door Products (C)
4. Steelcraft (S) – L18 Series - Thermal Break FT Series

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
   3. Manufacturers Basis of Design:
      b. Ceco Door Products (C) - 797 Mercury Series.
      c. Steelcraft (S) –Thermal Break FT Series

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
   3. Manufacturers Basis of Design:
      a. Curries Company (CU) - CM Series.
      b. Curries Company (CU) - M Series.
      c. Ceco Door Products (C)
      d. Steelcraft (S)

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.

2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

   a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.

5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.

7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.

8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot Welds per anchor.

9. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

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

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.

4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113
SECTION 081416 - FLUSH 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. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Light frames and glazing installed in wood doors.

B. Related Sections:

1. Division 08 Section “Door Schedule”.
2. Division 08 Section "Hollow Metal Doors and Frames".
3. Division 08 Section "Interior Aluminum Doors and Frames".
4. Division 08 Section "Glazing".
5. Division 08 Section "Door Hardware".

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

2. ANSI A208.1 – Wood Particleboard.
6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate location and extent of hardware blocking.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
   2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
      a. Provide samples for each species of veneer and core material.
      b. Finish veneer faced door samples with same materials proposed for factory finished doors.
   3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer’s warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors".

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL10C.
   1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer’s construction label, indicating compliance to independent 3rd party certification agency’s procedure, except for size.
   2. Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.
      1) Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.


PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.


   a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.

   b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.
2.2 CORE CONSTRUCTION

A. Structural Composite Lumber Core Doors:
   1. Structural Composite Lumber: Engineered hardwood composite wood products tested in accordance with WDMA IS.1A, Testing Cellulosic Composite Materials for Use in Fenestration Products containing no added Urea Formaldehyde.

B. Particleboard Core Doors:
   3. Blocking: As indicated under article “Blocking”.

C. Fire Resistant Composite Core Doors:
   1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.
   2. Blocking: As indicated under article “Blocking”.
   3. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 BLOCKING

A. Fire Rated Doors:
   1. Provide blocking as indicated below:
      a. HB8: Two 5 inch x 14 inch corner blocking and two 5 inch x 14 inch lock blocking on doors to have vertical rod exit devices.

2.4 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. VT Industries: Artistry Series.

B. Interior Solid Core Doors:
   1. Grade: Premium.
   2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
a. Manufacturer Standard Face: as selected by architect/owner.
b. Manufacturer Custom Face: as selected by architect/owner.
c. Match Existing.
d. Veneer as selected by architect/owner.


4. Assembly of Veneer Leaves on Door Faces:
   a. Running Match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Transom Match: Continuous match.

7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.

10. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.5 LIGHT FRAMES AND GLAZING

A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:
   1. Wood Species: Same species as door faces.
   2. Profile:
      a. M1 Flush Bead.
      b. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire Rated Doors over 20-minute Rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

   1. Manufacturers:
      a. Air Louver (LV).
      b. All Metal Stamping (AP).
      c. Anemostat (AN).
      d. Pemko (PE).

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.
2.6 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.
   1. Comply with requirements in NFPA 80 for fire rated doors.
   2. Undercut: As required per manufacturer’s templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."

D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.7 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.
   1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.
   2. Staining:
      a. Custom stain to match architect’s sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416
SECTION 08 1423 - IMPACT RESISTANT INTERIOR DOORS (FLUSH)

PART 1- GENERAL

1.1. SCOPE

1.2. All labor, material, equipment, and related services necessary to furnish and install all high impact resistant non-rated and fire-rated Acrovyn® Door Systems doors with flush faces as shown on the drawings or specified herein.

1.3. RELATED SECTIONS

1.4. Related Sections include the following:
   A. Division 6 Section 06 1000 Rough Carpentry
   B. Division 6 Section 06 4000 Architectural Woodwork
   C. Division 8 Section 081113 Hollow Metal Doors and Frames
   D. Division 8 Section 08 7100 Door Hardware
   E. Division 8 Section 08 8000 Glazing for glass view panels in flush wood doors.

1.5. REFERENCE STANDARDS

   A. ASTM G-21 and ASTM G-22 (Bacteria and Fungal resistance): Provide doors that do not support fungal and bacterial growth when tested in accordance with applicable provisions of ASTM G-21 and ASTM G-22.
   B. ASTM D-543 (Chemical and Stain Resistance): Provide doors that show chemical and stain resistance when tested in accordance with ASTM D-543.
   C. ASTM E152 - Methods of Fire Tests and Door Assemblies
   D. NFPA 252 Standard methods of fire tests of door assemblies
   E. UL-10C Positive Pressure fire tests of door assemblies
   F. NFPA 80 Fire Doors and Windows
   H. GGHC Title EP 4.1 PBT Elimination: Dioxins, Green Guide for Health Care v 2.2 ‘07
   I. WDMA Industry Quality Test Standards I.S.1A-04:
      1. WDMA TM-6 Test method for determining the durability of adhesives used in doors under accelerated aging conditions
      2. WDMA TM-7 Test method to determine the physical endurance of wood doors & associated hardware connections under accelerated operating conditions, Window and Door Manufacturers Association
      3. WDMA TM-8 Test methods to determine hinge loading resistance of wood door stiles, Window and Door Manufacturers Association
4. WDMA TM-10 - Test method to determine the screw holding capacity of wood door stiles, Window and Door Manufacturers Association

J. ANSI/BHMA A156.115-W-2006 American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames

K. FSC - Forestry Stewardship Council

1.6. SUBMITTALS

A. Submit in accordance with Section 013300 - Submittals

B. Product Data: For each type of door, submit manufacturer’s data sheets including details of core and edge construction.

C. Shop Drawings: Submit complete schedule indicating location, size, hardware sets, swing of each door; elevation of each type of door and construction details not covered in product data and other pertinent information. Indicate dimensions and locations of mortises and holes for hardware, fire ratings, and location of cutouts for glass.

1.7. Samples for verification of edge wrapping and edge replaceability. Banded edges will not be approved.

1.8. Certification: Submit certification that doors and frames comply with UL10c, Positive Pressure Fire Door Test Method.

1.9. Manufacturer’s limited lifetime warranty.

1.10. QUALITY ASSURANCE

A. Source Limitations: Obtain high impact resistant Door Systems flush doors through one source from a single manufacturer.


1. Doors shall meet performance attributes for the following performance duty level: Extra Heavy Duty (Standard Duty for FC5-NR)

2. Tolerances for warp, telegraphing, squareness and prefitting dimensions as per the latest edition of WDMA I.S.1A-04.

3. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-ratings indicated, based on testing according to UBC Standard 7-2, UL-10C Positive Pressure and NFPA 252.

4. Doors or trial doors of the type specified herein should be installed in an existing facility for over 6 months to verify quality and durability performance of product.

1.11. TRANSPORT, STORAGE, HANDLING AND SITE CONDITIONS

A. Transport, store, protect and handle products under guidelines of WDMA and manufacturer’s care and handling instructions.

B. Package doors individually using foam interleaf and stack on pallet, not exceeding 15 doors per pallet.

C. Mark each door with opening number used on shop drawings.

D. Accept doors on site in manufacturer’s standard packaging. Inspect for damage.
E. Do not store doors in damp or wet areas. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% or greater than 55%.

F. Do not subject doors to extreme conditions or changes in heat, dryness or humidity in accordance with the latest edition of WDMA I.S.1A-04.

G. Protect doors from exposure to natural and artificial light after delivery.

H. Doors should be lifted and carried when being moved, not dragged across one another.

1.12. PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver store, 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.

B. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% or greater than 55%. Note: Any claim for warp, bow, twist, or telegraphing may be denied if required humidity requirements are not maintained.

1.13. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that are deemed defective in materials or workmanship. Conditions are subject to the terms set forth in the manufacturer’s warranty.

1. Solid-Core Interior Doors: provide manufacturer’s limited lifetime written warranty guarantee against warp, delamination and defects in materials and workmanship.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with all requirements, provide one of the following:


2.2. MATERIALS

2.3. Door Construction

A. Non Fire Rated Doors and 20-minute interior FLUSH doors conforming to WDMA I.S.1A-04 and the following:

1. Thickness: 1 3/4” +/-1/16”, (44.45mm +/- 1.58mm)

2. Core: Solid. Interior stiles and rails bonded. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.


   b. FSC Certified Particleboard grade LD-1, 32 lb/ft3) (14.51kg/m³) density, no added urea formaldehyde content, ANSI A208.1.2009, CARB Phase I compliant [or]
c. Agrifiber Particleboard Grade LD-1, 26-28 lb/ft³ (11.79 - 12.70kg/m³) density - rapidly renewable and no added urea formaldehyde content, CARB Phase I compliant [or]
d. Structural Composite Lumber, 39 lb/ft³ (17.69kg/m³) density - no added urea formaldehyde content

3. Crossbanding: FSC certified

4. Replaceable door stiles: ⅜” (19.05mm) replaceable stiles shall be field replaceable if ever damaged by impact.

5. Replaceable door edges: Fully wrapped and rounded Acrovyn or stainless steel door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
   a. Subject to the terms and conditions of our Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn edge covers AT NO COST to the Owner.

6. WDMA I.S.1A-04 Performance Duty Level: Extra Heavy Duty

7. Durability Performance: Cycle Slam WDMA TM-7, 1990 Extra Heavy Duty - 1,000,000 cycles to insure durability of entire door construction

B. 45 and 60-minute interior FLUSH fire rated doors conforming to WDMA I.A. 1-A and the following:

1. Thickness: 1 3/4” +/-1/16”, (44.45mm +/- 1.58mm)


3. Crossbanding: FSC certified

4. Replaceable door stiles: ⅜” (19.05mm) replaceable stiles shall be field replaceable if ever damaged by impact.

5. Replaceable door edges: Fully wrapped and rounded Acrovyn [or] stainless steel door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
   a. Subject to the terms and conditions of our Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn edge covers AT NO COST to the Owner.

6. WDMA I.S.1A-04 Performance Duty Level: Extra Heavy Duty

7. Durability Performance: Cycle Slam WDMA TM-7, 1990 - 1,000,000 cycles to insure durability of entire door construction

C. 90-minute interior FLUSH fire rated doors conforming to WDMA I.S.1A-04 and the following:

1. Thickness: 1 3/4” +/-1/16”, (44.45mm +/- 1.58mm)

2. Core: Solid. Interior stiles and rails bonded, non-combustible mineral composite construction 25-32 lb/ft³ density, no added urea formaldehyde content. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.

3. Crossbanding: mineral composite

4. Replaceable door edges: Fully wrapped and rounded Acrovyn [or] stainless steel door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.

5. WDMA I.S.1A-04 Performance Duty Level: Extra Heavy Duty
6. Durability Performance: Cycle Slam WDMA TM-7, 1990 - 1,000,000 cycles to insure durability of entire door construction.

D. Door Faces:
   1. Finish
      a. Wood grain or solid color impact resistant, PVC-free Finish to be: As selected from manufacturers full range.
   2. Face material base color must be integral throughout to eliminate discoloration caused by scratching.
   3. Face Veneer Wear Index - Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles to prove out resistant to scuffing and scratching.
   4. Face Veneer Impact Resistance - ASTM D-4226: 86 in/lb. (99.08kg/cm²) to confirm impact resistance of face finish.

E. Door stiles to meet or exceed the following performance testing to ensure hardware fastener holding strength:
   1. WDMA TM-8 "Hinge Loading Resistance" Extra Heavy Duty
   2. WDMA TM-10 Screw Holding Capacity" Extra Heavy Duty

F. Door Edges:
   1. Finish:
      a. Edges of door to be field replaceable, PVC-free impact resistant finish to match door face.
      b. 20 gauge (.81mm) Stainless Steel, No. 4 finish.
   2. Edges are covered by our “Edge of a Lifetime” Lifetime Limited Warranty from Construction Specialties Acrovyn Door Systems against damage, and begins 1 month after installation. Refer to warranty for full details.
   3. Edges are to fully wrap the door vertical stiles to eliminate banded edges thus improving durability and impact resistance.
   4. Replaceable edges to be ¾” (19.05MM) thick for proper edge and face protection.
   5. Door edges shall be exclusive of fasteners to improve appearance.
   6. Edges must be flush with face of door thus eliminating raised edges that could be torn off.
   7. Edges to include ¼” (6.35mm) radius edges to improve impact deflection. Square or banded edges should not be permitted.
   8. Edges are to be extruded (not formed) to ensure correct appearance and proper door fit.
   9. Edges to be provided as part of the construction of the door from single source manufacturer.

G. Adhesives
   1. Crossbanding to core adhesives shall be Type II, urea formaldehyde free I to improve structural integrity of door.
   2. Door faces are to be applied to the crossbanded core using Type I, urea formaldehyde free adhesives to eliminate delamination.
2.4. FABRICATION, GENERAL

A. Doors shall be prefit and beveled at the factory to fit the openings to reduce handling and onsite labor costs. Prefit tolerances shall be in accordance with the requirements of WDMA I.S.1A-04, latest edition.

B. For fire rated doors comply with clearance requirements of referenced quality standard for fitting in accordance with requirements listed in NFPA 80.

C. Coordinate measurements of hardware mortises in metal frames. Contractor or door distributor to verify dimensions and alignment before factory machining.

D. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame shop drawings, and hardware templates.

E. Light openings must be cut by the manufacturer or by a certified machining distributor.

F. To ensure proper fit of the doors bevel on both strike and hinge edges to be 1/8” in 2” (3.175mm in 50.8mm)

G. Top and bottom rails shall be factory sealed with an approved wood sealer to eliminate moisture from entering into core thus eliminating warp.

H. Blocking: provide blocking approved for use in doors of fire ratings indicated as needed to eliminate through-bolting for surface applied hardware.

2.5. ACCESSORIES

A. Glazing Stops
   1. Non Rated
      a. Wood beads
      b. Metal vision frames
      c. Veneer wrapped metal finished frames stained or painted to match the door faces AMS 110
      d. Acrovyn Vision Panel Covers
         1) Acrovyn, molded to fit over an All Metal Stamping Model 110 metal vision frame
         2) Adhered to frame with double sided tape- removable to allow frame/glass access
         3) Acrovyn Panel cover finish matches Acrovyn door face finish (or choose alternative Acrovyn color for contrast)
   2. Fire Rated
      a. Wood bead (20, 45 and 60-minute only) [or]
      b. Metal vision frames [or]
      c. Veneer wrapped metal finished frames stained or painted to match the door faces (20, 45 and 60-minute only) [or]

B. Glass: Refer to Section 08 8000 for glass types.
PART 3 - INSTALLATION

3.1. EXAMINATION

A. Inspect all doors prior to hanging. Repair noticeable marks or defects that may have occurred from improper storage or handling. Field repairs and touchups are the responsibility of the installing contractor upon completion of the initial installation. Field touchup shall include repair of job inflicted mars and final cleaning of finished doors.

B. Examine door frames and verify that they comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.

C. Adjust frames to plumb condition before door installation. Tolerances for warp, squareness and pre-fitting dimensions shall be as per latest edition of WDMA I.S.1A-04.

D. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

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

3.2. INSTALLATION

A. Handle doors in accordance with recommendations of WDMA I.S.1A-04 “Care and Installation at Job Site.”

B. Condition doors to average temperature and humidity in area of installation for not less than 48 hours prior to installation.

C. Install doors to comply with manufacturer’s written instructions, referenced quality standard and as indicated.

D. Install fire rated doors in corresponding fire-rated frames according to NFPA-80 and ITS/WH requirements.

E. Factory fitted doors: Align in frames for uniform clearance at each edge.

F. Set doors plumb, level, square and true.

G. In the field trimming:
   1. Trim door height by cutting door bottom edges to a maximum of ¾” (19.05mm) per NFPA 80.
   2. Trimming of fire rated doors in width can only be done by the manufacturer or a certified machining distributor under special guidance of the manufacturer.

H. Drill pilot holes for screws and bolts using templates provided by hardware manufacturer.

I. Exercise caution when drilling pilot holes and installing hinges so that pilot holes are not over drilled and screws are not over torqued. Follow manufacturer’s installation instructions.

J. Reseal exposed tops and bottom rails of any doors that required site alteration with an approved wood sealer.

K. Hardware installation: See Division 8 Section “Door Hardware”.

L. Clean prefinished doors with a rag in concert with water or household cleaners such as Fantastikà, Formula 409à, or equivalent. Following use of the cleaner, the cleaned surface should be “rinse wiped” with clean water and wiped dry to remove any remaining residue.
3.3. ADJUSTING

A. Operating: Re-hang or replace doors that do not swing or operate freely.

B. Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 1423
SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1  GENERAL

1.1. SECTION INCLUDES
   A. Wall access door and frame units.

1.2. RELATED REQUIREMENTS
   A. Section 04 2000: Openings in masonry.

1.3. REFERENCE STANDARDS
   A. ITS (DIR) - Directory of Listed Products; current edition.

1.4. SUBMITTALS
   A. See Section 01 3300 - Submittals for submittal procedures.
   B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
   C. Manufacturer's Installation Instructions: Indicate installation requirements.

1.5. QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2  PRODUCTS

2.1. ACCESS DOORS AND PANELS ASSEMBLIES
   A. Wall-Mounted Units:
      1. Location: As indicated on drawings.
      4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
      5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   B. Wall-Mounted Units in Wet Areas:
      1. Location: As indicated on drawings.
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Wall Fire-Rating: As indicated on drawings.
   4. Size: 12 inch by 12 inch.

D. Ceiling-Mounted Units:
   1. Location: As indicated on drawings.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size - Other Ceilings: 12 inch by 12 inch.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Fire-Rated Ceiling-Mounted Units:
   1. Location: As indicated on drawings.
   2. Ceiling Fire-Rating: As indicated on drawings.
   4. Size: 12 inch by 12 inch.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2. WALL-MOUNTED UNITS

A. Manufacturers:
   2. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Air-Tight, Water-Tight, Wall and Ceiling Mounted Units: ACUDOR ADWT.
8. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall-Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.

2. Style: Exposed frame with door surface flush with frame surface.
   a. Gypsum Board Mounting Criteria: Use drywall bead type frame.

3. Door Style: Single thickness with rolled or turned in edges.

4. Frames: 16 gage, 0.0598 inch, minimum thickness.

5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
   a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
   b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.


7. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.

8. Door/Panel Size: As indicated on the drawings.

9. Hardware:
   a. Hardware for Fire-Rated Units: As required for listing.
   b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
   c. Handle: Fixed.
   d. Latch/Lock: Tamperproof tool-operated cam latch.
   e. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.
3.3. INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 08 3100
SECTION 08 4229 - SLIDING AUTOMATIC ENTRANCES

GENERAL

1.1. SECTION INCLUDES

A. This Section includes the following types of automatic entrances:
   1. Exterior and interior sliding automatic entrances.

B. Related Sections:
   1. Division 7 Sections for caulking to the extent not specified in this section.
   2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished and installed separately in Division 8 Section.
   3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
   4. Division 8 Section Glazing for materials and installation requirements of glazing for automatic entrances.
   5. Division 26 Sections for electrical connections provided separately, including conduit and wiring for power to sliding automatic entrances.

1.2. REFERENCE STANDARDS

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. Underwriters Laboratories (UL):
   1. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

C. American National Standards Institute (ANSI) / Builders’ Hardware Manufacturers Association (BHMA):
   2. ANSI/BHMA A156.5: Standard for Auxiliary Locks and Associated Products

D. American Society for Testing and Materials (ASTM):
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

E. American Association of Automatic Door Manufacturers (AAADM):

F. National Fire Protection Association (NFPA):

G. International Code Council (ICC):
1. IBC: International Building Code

H. Building Officials and Code Administrators International (BOCA), 1999:

I. International Organization for Standardization (ISO):

1. ISO 9001 - Quality Management Systems

J. National Association of Architectural Metal Manufacturers (NAAMM):

1. Metal Finishes Manual for Architectural and Metal Products.

K. American Architectural Manufacturers Association (AAMA):

1. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
2. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
3. AAMA 701 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.

1.3. DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

B. Safety Device: Device that prevents a door from opening or closing, as appropriate.

1.4. PERFORMANCE REQUIREMENTS

A. General: Provide automatic entrance door assemblies capable of withstanding loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).

C. Opening-Force Requirements for Egress Doors: Force shall be adjustable; but, not more than 50 lbf (222 N) required to manually set swinging egress door panel(s) in motion.

D. Closing-Force Requirements: Not more than 30 lbf (133 N) required to prevent door from closing.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, wiring diagram, electrical characteristics and connection requirements.

2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.

C. Product Data: Provide data on system components, sizes, features, and finishes.

D. Color Samples for selection of factory-applied color finishes.
E. Closeout Submittals:
   1. Owner’s Manual and operating instructions.
   2. Maintenance Data
   3. Warranties.

1.6. QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained for installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001.

C. Manufacturer shall have in place a national service dispatch center providing 24 hours a day, 7 days a week, emergency call back service.

D. Certifications: Automatic sliding door systems shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
   1. ANSI/BHMA A156.10.
   3. UL 325 listed.
   4. IBC 2012

E. Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.

F. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of automatic entrance door assemblies and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.7. PROJECT CONDITIONS

A. Field Measurements: General Contractor shall verify openings to receive automatic entrance door assemblies by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.

C. Other trades: General Contractor shall advise of any inadequate conditions or equipment.

1.8. COORDINATION

A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.
B. Electrical System Roughing-in: Coordinate layout and installation of automatic entrance door assemblies with connections to power supplies.

1.9. WARRANTY

A. Automatic Entrances shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

B. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

C. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PRODUCTS

2.1. AUTOMATIC ENTRANCES

A. Manufacturer: Stanley Access Technologies; Dura-Glide™ 3000 Series sliding automatic entrances.

B. Other Acceptable Manufacturers Subject to compliance with requirements:
   2. Besam Entrance Solutions

2.2. MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

B. Sealants and Joint Fillers: Performed under Division 7 Section "Joint Sealants".

2.3. AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. General: Provide manufacturer's standard automatic entrance door assemblies including doors, sidelights, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.

B. Sliding Automatic Entrances:
   1. Configuration: Two sliding leaves and two full sidelights; bi-parting.
2.4. COMPONENTS

A. Framing Members: Manufacturer's standard extruded aluminum reinforced as required to support imposed loads.
   1. Nominal Size: 1 3/4 inch by 4 1/2 inch (45 by 115 mm).
   2. Concealed Fastening: Framing shall incorporate a concealed fastening pocket, and continuous flush insert cover, extending full length of each framing member.

B. Stile and Rail Doors and Sidelights: Manufacturer's standard 1 ¾ inch (45 mm) thick glazed doors with extruded-aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom rails.
   2. Stile Design: Narrow stile; 2 inch (51 mm) nominal width.
   3. Bottom Rail Design: Minimum 4 inch (102 mm) nominal height.
   4. Muntin Bars: Horizontal tubular rail member for each door; 2 inch (51 mm) nominal height.

C. Glazing: Furnished under Division 8 Section Glazing. All Glazing furnished under separate section shall be 1 inch (25 mm) insulated glazing units with not less than 1/2 inch (13 mm) air space.

D. Headers: Fabricated from extruded aluminum and extending full width of automatic entrance door units to conceal door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
   1. Mounting: Concealed, with one side of header flush with framing.
   2. Capacity: Capable of supporting up to 220 lb (100 kg) per panel, up to four panels, over spans up to 14 feet (4.3 m) without intermediate supports.

E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment of at least 1/8 inch (3 mm); consisting of urethane with precision steel lubricated ball-bearing wheels, operating on a continuous roller track. Support panels from carrier assembly by load wheels and anti-riser wheels with factory adjusted cantilever and pivot assembly. Minimum two ball-bearing load wheels and two anti-rise rollers for each active leaf. Minimum load wheel diameter shall be 2 1/2 inch (64 mm); minimum anti-rise roller diameter shall be 2 inch (51 mm).

F. Thresholds: Manufacturer's standard thresholds as indicated below:
   1. Continuous standard tapered extrusion double bevel.
   2. All thresholds to conform to details and requirements for code compliance.

G. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

H. Signage: Provide signage in accordance with ANSI/BHMA A156.10.

2.5. DOOR OPERATORS

A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, operation under normal traffic load for type of occupancy indicated.
B. Electromechanical Operators: Self-contained overhead unit powered by a minimum of 1/4 horsepower, permanent-magnet DC motor with gear reduction drive, microprocessor controller; and encoder.
   2. Features:
      a. Adjustable opening and closing speeds.
      b. Adjustable back-check and latching.
      c. Adjustable braking.
      d. Adjustable hold-open time between 0 and 30 seconds.
      e. Obstruction recycle.
      f. On/Off switch to control electric power to operator.
      g. Energy conservation switch that reduces door-opening width.
      h. Closed loop speed control with active braking and acceleration.
      i. Adjustable obstruction recycle time delay.
      j. Self adjusting stop position.
      k. Self adjusting closing compression force.
      l. Onboard sensor power supply.
      m. Onboard sensor monitoring.
      n. Optional Switch to open/Switch to close operation.
   4. Drive System: Synchronous belt type.

C. Electrical service to door operators shall be provided under Division 16 Electrical. Minimum service to be 120 VAC, 5 amps.

2.6. ELECTRICAL CONTROLS

A. Electrical Control System: Electrical control system shall include a microprocessor controller and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed. Systems utilizing external magnets and magnetic switches are not acceptable.

B. Performance Data: The microprocessor shall collect and store performance data as follows:
   1. Counter: A non-resettable counter to track operating cycles.
   2. Event Reporting: Unit shall include event and error recording including number of occurrences of events and errors, and cycle count of most recent events and errors.
   3. LED Display: Display presenting the current operating state of the controller.

C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:
   2. Main Fuse Protection.
3. Electronic Surge Protection.
5. Auto-Resetting sensor supply protection.

D. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.

E. Obstruction Recycle: Provide system to recycle the sliding panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.

F. Programmable Controller: Microprocessor controller shall be programmable and shall be designed for connection to a local configuration tool. Local configuration tool shall be a software driven handheld interface. The following parameters may be adjusted via the configuration tool.
   1. Operating speeds and forces as required to meet ANSI/BHMA A156.10.
   2. Adjustable and variable features as specified in 2.5, B., 2.
   3. Reduced opening position.
   4. Fail Safe/Secure control.
   5. Firmware update.
   6. Trouble Shooting
      a. I/O Status.
      b. Electrical component monitoring including parameter summary.
   7. Software for local configuration tool shall be available as a free download from the sliding automatic entrance manufacturer’s internet site. Software shall be compatible with the following operating system platforms: Palm®, Android®, and Windows Mobile®.

2.7. ACTIVATION AND SAFETY DEVICES

A. Motion Sensors: Motion sensors shall be mounted on each side of door header to detect pedestrians in the activating zone, and to provide a signal to open doors in accordance with ANSI/BHMA A156.10. Units shall be programmable for bi-directional or uni-directional operation and shall incorporate K-band microwave frequency to detect all motion in both directions.

B. Presence Sensors: Presence sensors shall be provided to sense people or objects in the threshold safety zone in accordance with ANSI/BHMA A156.10. Units shall be self-contained, fully adjustable, and shall function accordingly with motion sensors provided. The sensor shall be enabled simultaneously with the door-opening signal and shall emit an elliptical shaped infrared presence zone, centered on the doorway threshold line. Presence sensors shall be capable of selectively retuning to adjust for objects which may enter the safety zone; tuning out, or disregarding, the presence of small nuisance objects and not tuning out large objects regardless of the time the object is present in the safety zone. The door shall close only after all sensors detect a clear surveillance field.
C. Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting. Beams shall be monitored by electrical controls for faults and shall fail safe.

D. Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause automatic operation to cease until the fault is corrected.

2.8. HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers for entrances and uses indicated.

B. Emergency Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to full 90 degrees from any position in sliding mode. Maximum force to open panel shall be 50 lbf (222 N) according to ANSI/BHMA A156.10. Interrupt powered operation of panel operator while in breakaway mode.

1. Emergency breakaway feature shall include at least one adjustable detent device mounted in the top of each breakaway panel to control panel breakaway force.

2. Limit Arms: Limit arms shall be provided to control swing of sliding non-sliding panels on break-out; swing shall not exceed 90 degrees. Limit arms shall be spring loaded to prevent shock, and include adjustable friction damping.

C. Deadlocks: Manufacturer's standard deadbolt operated by interior and exterior cylinders; with minimum 1 inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.

1. Cylinders: As specified in Division 8 Section "Door Hardware."

2. Hook Latch: Laminated-steel hook, mortise type.

3. Lock/Unlock Indicator: Provide lock position indicators integrated with locking system. Indicators shall be stile mounted on the secure side of the door and provide a visual display of lock position; "OPEN" in black letters when unlocked, "LOCKED" in red letters when locked.

4. Two-Point Locking: Provide locking system that incorporates a device in the stile of active door leaves that automatically extends a flush bolt into overhead carrier assembly.

D. Control Switch: Provide manufacturer’s standard header mounted rocker switches to allow for full control of the automatic entrance door. Controls to include, but are not limited to:

1. One-way traffic

2. Reduced Opening

3. Open/Closed/Automatic

E. Power Switch: Sliding automatic entrances shall be equipped with a two position “On/Off” illuminated rocker switch to control power to the door.

F. Sliding Weather Stripping: Manufacturer's standard replaceable components complying with AAMA 701; made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

G. Weather Sweeps: Manufacturer's standard adjustable nylon brush sweep mounted to underside of door bottom.
2.9. FABRICATION

A. General: Factory fabricates automatic entrance door assembly components to designs, sizes, and thickness indicated and to comply with indicated standards.

1. Form aluminum shapes before finishing.
2. Use concealed fasteners to greatest extent possible.
   a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
   b. Reinforce members as required to receive fastener threads.

B. Framing: Provide automatic entrances as prefabricated assemblies.

1. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
3. Form profiles that are sharp, straight, and free of defects or deformations.
4. Prepare components to receive concealed fasteners and anchor and connection devices.
5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated.

F. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.

2.10. ALUMINUM FINISHES

A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.

B. Class I, Color Anodic Finish: AA-M12C22A42/A44 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.70 mils minimum complying with AAMA 611-98, and the following:

1. Color: Dark Bronze.
2. AAMA 606.1 – Integral Color Anodic Finishes for Architectural Aluminum
3. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.
EXECUTION

3.1. INSPECTION

   A. Examine conditions for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

   A. General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly secure non-movement joints.

   B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
      1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
      2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.

   C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.

   D. Glazing: Performed under Division 8 Section "Glazing" in accordance with sliding automatic entrance manufacturer’s instructions.

   E. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants".

3.3. FIELD QUALITY CONTROL

   A. Testing Services: Factory Trained Installer shall test and inspect each automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.4. ADJUSTING

   A. Adjust door operators, controls, and hardware for smooth and safe operation, for tight closure, and complying with requirements in ANSI/BHMA A156.10.

3.5. CLEANING AND PROTECTION

   A. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish. Comply with requirements in Division 8 Section “Glazing”, for cleaning and maintaining glass.

END OF SECTION 08 4229
SECTION 08 5413 - FIBERGLASS WINDOWS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Factory fabricated fiberglass windows with fixed and operating sash.
B. Glazed by factory or on-site.
C. Operating hardware.
D. Insect screens.

1.2. RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.
B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.3. REFERENCE STANDARDS


1.4. ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
D. Samples: Submit 12 x 12 inch in size, illustrating window frame section.
E. Submit two samples of operating hardware.
F. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.
G. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
1. Evidence of AAMA Certification.
2. Evidence of WDMA Certification.
3. Evidence of CSA Certification.
4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

H. Manufacturer's Qualification Statement.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.8. FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.9. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide ten year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Fiberglass Windows:
   1. Pella Corporation; Pella Impervia: www.pellacommercial.com/#sle.
   2. Marvin Window and Door, Ultrex: www.marvin.com/integrity
   3. Milgard Windows and Doors; www.milgard.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.2. WINDOW UNITS

A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
   1. Configuration: As indicated on drawings.

3. Color: White at interior and Black at exterior

4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

6. Thermal Movement: Design to accommodate thermal movement caused by 100 degrees F temperature change without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

2.3. PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/L.S.2/A440 requirements for specific window type:
   1. Performance Class (PC): LC.
   2. Performance Grade (PG): 25, with minimum design pressure (DP) of 25.06 psf.

B. Deflection: Limit member deflection to 1/200 of the longer dimension with full recovery of glazing materials.

C. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

D. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 pounds per square foot.

E. Air Leakage: Maximum of 0.1 cu ft/min/sq ft at 6.27 pounds per square foot differential pressure, when tested in accordance with ASTM E283.

2.4. COMPONENTS

A. Frames: 3 3/32 inch wide by 2 inch deep profile; flush glass stops of screw fastened type.
   1. Type: Nailing flange (for new windows).
   2. Frame Corners: Mitered and joined with nylon corner locks.

B. Mullion: 2 inch wide by 1 inch deep profile.

C. Sills: 1 3/4 inch nominal thickness, composite fiberglass; sloped for positive wash; fit under sash to 1/2 inch beyond wall face; one piece full width of opening.

D. Stools: 1 inch nominal thickness, fiberglass; fit under sash to project 1/2 inch beyond interior wall face; one piece full width of opening.

E. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.

F. Insect Screens: Woven Charcoal fiberglass mesh; 18 by 16 mesh size.

G. Operable Sash Weather Stripping: Resilient PVC; permanently resilient, profiled to effect weather seal.
H. Fasteners: Stainless steel.

I. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.5. GLASS AND GLAZING MATERIALS

A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC when tested in accordance with ASTM E 2190.

B. Glazing Method: Insulating glass

C. Glass Type: Low E1, E2, E3, or E3/ERS air or Argon gas.

D. Glazing Seal: Silicone bedding at exterior and a glazing boot to interior

E. Perimeter Spacer: Default color is mill finish (stainless). An optional black perimeter spacer color is available for all interior color selections.

2.6. HARDWARE

A. Double Hung Sash: Metal and nylon spiral friction slide cylinder, each sash, each jamb.
   2. Two (2) locks installed on units with a rough opening width greater than 30 inches.
   3. Sash Lift: Zinc die cast contoured sash lift
   4. Standard Color: White, Bronze, Ebony (Matches interior finish)

B. Top and Bottom Tilt Latches: Ergonomic tilt latches attached to the upper corners of the top and bottom sash for easy tilting and sash removal

2.7. FABRICATION

A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.

B. Form sills and stools in one piece. Slope sills for wash.

C. Form snap-in glass stops, closure molds, weather stops, and flashings for tight fit into window frame section.

D. Form weather stop flange to perimeter of unit.

E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

F. Arrange fasteners to be concealed from view.

G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.

H. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.

I. Double weatherstrip operable units.
J. Factory glaze window units.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2. INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install windows in accordance with ASTM E2112.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Set sill members and sill flashing in continuous bead of sealant.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install operating hardware.

3.3. TOLERANCES

3.4. FIELD QUALITY CONTROL

A. Provide services of fiberglass window manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

3.5. ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.6. CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove protective material from pre-finished surfaces.

C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION 08 5413
SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Door Hardware Sets”.
   2. Division 08 Section “Hollow Metal Doors and Frames”.
   3. Division 08 Section “Plastic Laminate Faced Wood Doors”.
   4. Division 08 Section “Flush Wood Doors”.
   5. Division 08 Section “Clad Wood Doors”.
   6. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   7. Division 08 Section “Automatic Entrances”.
   8. Division 08 Section “Access Control Hardware”.
   9. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:
   1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Seven years for heavy duty cylindrical (bored) locks and latches.
2. Five years for exit hardware.
3. Fifteen years for manual surface door closer bodies.
4. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:
   a. Hager Companies (HA).
   b. Ives (IV).
   c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Manufacturers:
   a. Hager Companies (HA).
   b. Ives (IV).
   c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
   d. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 POWER TRANSFER DEVICES

A. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:
   a. Hager Companies (HA) - Quick Connect.
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
   c. Adams Rite.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:
   a. Door Controls International (DC).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).
B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings andcams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Manufacturer’s Standard.

D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

E. Permanent Cores: Match standard. Reference Division 01 for material required under project. Installation to be included under Division 08 "Door Hardware" base bid package.

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

F. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Key locks to Owner's existing system.

G. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).

H. Construction Keying: Provide construction master keyed cylinders.

I. Construction Keying: Provide temporary keyed construction cores.

J. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

K. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:
   a. Lund Equipment (LU).
   b. MMF Industries (MM).
   c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:
   a. Medeco (MC).
   b. Traka (TA).
   c. Assa Abloy

Q. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into “Key Wizard” software.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Manufacturers:
   a. Corbin Russwin Hardware (RU) – CL3300 Series.
   b. Sargent Manufacturing (SA) – 10 Line.
   c. Yale Locks and Hardware (YA) 5400LN Series.

2.7 STAND ALONE ACCESS CONTROL LOCKING DEVICES

A. Stand Alone Touchscreen Locksets: ANSI A156.2, Series 4000, Grade 1 locking mechanism complete with integrated touchscreen for access and programming. Voice-guided programming with 12-digit PIN code selection and up to 1000 user option. Locks to accept standard, small format interchangeable core, security and patented cylinders. Battery-operated, with low power indicator, or hard-wired (9 Volt external power supply) option.

1. Manufacturers:
   a. Yale Locks and Hardware (YA) - nexTouch Series.
   b. SDC Security Door Controls.
   c. Kaba

2.8 AUXILIARY LOCKS

A. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 certified narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8” diameter bolts.

1. Manufacturers:
   a. Adams Rite Manufacturing (AD) - MS1850S / MS1950 Series.
   b. PDQ
   c. Sargent

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTROMAGNETIC LOCKING DEVICES
A. Concealed Shear Locks: Shear locks to be self-aligning magnetic type suitable for mortised mounting with minimum holding force strength of 1000 lbs. Locks to be "dual voltage" capable of accepting either 12 or 24VDC without field adjustment at the time of the installation. Electronics are to be fully sealed against tampering and allow exterior weatherproof applications. Locks can be mounted at the top or side of the door and will operate on either single or double acting doors. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.

1. Manufacturers:
   a. Security Door Controls (SD) - Shear EMLock 1500 Series.
   b. Securitron (SU) - SAM Series.
   c. Dynalock
   d. Schlage

2.11 CONVENTIONAL EXIT DEVICES
A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer’s heavy duty escutcheon trim with threaded studs for thru-bolts.
   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.


9. Rail Sizing: Provide exit device rails factory sized for proper door width application.

10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:
   a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
   b. Sargent Manufacturing (SA) - 80 Series.
   c. Yale Locks and Hardware (YA) 7000 Series.

C. Security Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified rim panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be constructed of high grade, heat treated, corrosion resistant nickel steel alloy, and have a full 3/4” throw projection with slide action positive deadlocking.


2. Manufacturers:
   a. Corbin Russwin Hardware (RU) - ED4000S / ED5000S Series.
   b. Yale Locks and Hardware (YA) 7000 Series.
   c. Sargent Manufacturing (SA)

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:
   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. Norton Door Controls (NO) - 7500 Series.
   c. Yale Locks and Hardware (YA) - 4400 Series.

C. Door Closers, Surface Mounted (Unitrol): Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:
   a. Corbin Russwin Hardware (RU) - Unitrol Series.
   b. Norton Door Controls (NO) - Unitrol Series.
   c. Yale Locks and Hardware (YA) - Unitrol Series.

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2” less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1” less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer’s designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

   1. Manufacturers:
      a. Hiawatha, Inc. (HI).
      b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
      c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

   1. Manufacturers:
      a. Rixson Door Controls (RF).
      b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
      c. Sargent Manufacturing (SA).
2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
2. Reese Enterprises, Inc. (RE).

2.16 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

   a. Security Door Controls (SD) - DPS Series.
   b. SecuriTron (SU) - DPS Series.
   c. Schlage

B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
1. Manufacturers:
   a. Security Door Controls (SD) - 630 Series.
   b. Securitron (SU) - BPS Series.
   c. Schlage.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.


3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.
C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100
SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.2. RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework: Cabinets with requirements for glass shelves.

B. Section 07 2500 - Weather Barriers.

C. Section 08 4229 - Automatic Entrances: Glazing furnished as part of door assembly. Provide insulated glazing as specified within this section.

D. Section 08 5413 - Fiberglass Windows: Glazing furnished by window manufacturer.

E. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.3. REFERENCE STANDARDS


P. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
R. ITS (DIR) - Directory of Listed Products; current edition.
W. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.5. SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.
B. Product Data on Insulating Glass Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handing and installation requirements.
C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
D. Samples: Submit two samples 12 by 12 inch in size of glass units.
E. Certificate: Certify that products of this section meet or exceed specified requirements.
F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
1.6. QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.7. FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Insulated Glass Fabricators:
   1. Oldcastle Building Envelope™
   2. Pilkington North America
   3. Vetrotech Saint-Gobain
   4. Viracron, Inc

B. Float Glass Manufacturers:
   1. AGC Glass North America, Inc; www.agcglass.com/#sle.

C. Fire-Resistance-Rated Glass: Provide products as required to achieve indicated fire-rating period.
   1. Manufacturers:
      2. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
2.2. PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
      a. Refer to Section 07 2500.
   2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
   3. To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

2.3. GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
   3. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality-Q3, color and performance characteristics as indicated.

2.4. INSULATING GLASS UNITS

A. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal Edge Spacers: Aluminum, bent and soldered corners.

5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.


7. Purge interpane space with dry air, hermetically sealed.

B. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.

1. Applications: Exterior glazing unless otherwise indicated.

2. Basis-of-Design Product: (Sungate 400 Low-E Glass) Solargray + Sungate 400 (3) clear as manufactured by Vitro Architectural Glass formally PPG or a comparable product by one of the manufactures specified in paragraph 2.1 above.

3. Space between lites filled with air.

   a. Tint: Clear.
   b. Coating: Low-E (passive type), on #3 surface.

5. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
   a. Tint: Gray.
   b. Coating: solar gray tint, on #2 surface.

6. Total Thickness: 1 inch.

7. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, nominal.


9. Shading Coefficient: 0.30, nominal.

10. Solar Heat Gain Coefficient (SHGC): 0.39, nominal.

11. Visible Light Reflectance, Outside: 12 percent, nominal.


C. Type IG-2 - Insulating Glass Units: Safety glazing.

1. Applications:
   a. Glazed lites in exterior doors.
   b. Glazed sidelights and panels next to doors.
   c. Other locations required by applicable federal, state, and local codes and regulations.
   d. Other locations indicated on drawings.

2. Space between lites filled with air.

3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.

4. Total Thickness: 1 inch.
5. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, nominal.
7. Shading Coefficient: 0.30, nominal.

2.5. GLAZING UNITS

A. Type G-2 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.
   5. Glazing Method: Dry glazing method, gasket glazing.

B. Type G-3 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
   1. Applications:
      a. Glazing in fire-rated door assembly.
      b. Glazing in fire-rated window assembly.
      c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
      d. Other locations as indicated on drawings.
   2. Glass Type: Multi-laminate annealed glass with intumescent fire retardant interlayers.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Glazing Method: As required for fire rating.
   6. Fire-Rating Period: 60 minutes.
      a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
      b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
      d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
      e. "XXX" - placeholder that represents fire-rating period, in minutes.
8. Manufacturers:
   a. GGI - General Glass International; Pyrobel:  www.generalglass.com/#sle.
   b. SAFTIFIRST, a division of O'Keefe's Inc; SuperLite II-XLM 60:  www.safti.com/#sle.
   d. Vetrotech North America; Contraflam 60:  www.vetrotechusa.com/#sle.

C. Type G-5 - Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Glazed sidelights to doors, except in fire-rated walls and partitions.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

D. Type G-15 - Glass Shelves:
   1. Applications: Locations as indicated on drawings.
   2. Tint: Clear.
   3. Glass Type: Fully tempered float glass with ground edges and corners; ASTM C1048.
   4. Thickness: 1/4 inch, nominal.

2.6. FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
   2. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
   3. Grind smooth and polish exposed glass edges and corners.

2.7. GLAZING COMPOUNDS

A. Type GC-2 - Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
2.8. ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   4. Manufacturers:
      b. Tremco Global Sealants; : www.tremcosealants.com/#sle.
      c. 3M: www.3M.com

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.1. VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.
3.3. INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Retain both paragraphs below if glazing with wedge-shaped gaskets is required for Project.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

M. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

N. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

O. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

P. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

Q. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.
3.4. INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)
   A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
   B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
   C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
   D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5. INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)
   A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
   B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
   C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
   D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
   E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
   F. Carefully trim protruding tape with knife.

3.6. INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)
   A. Application - Interior Glazed: Set glazing infills from the interior of the building.
   B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
   C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
   D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
   E. Place glazing tape on free perimeter of glazing in same manner described above.
   F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
   G. Carefully trim protruding tape with knife.

3.7. CLEANING
   A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
   B. Remove non-permanent labels immediately after glazing installation is complete.
   C. Clean glass and adjacent surfaces after sealants are fully cured.
   D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.
3.8. PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 8000
SECTION 09 0561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1. SECTION INCLUDES

A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Broadloom carpet.
   3. Carpet tile.
   4. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency’s report and is due to a condition not under Contractor’s control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

F. Patching compound.

G. Remedial floor coatings.

H. Remedial floor sheet membrane.

1.2. RELATED REQUIREMENTS

A. Section 01 2200 - Unit Prices: Bid pricing for remediation treatments if required.

B. Section 01 7419 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.

C. Section 03 3000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

D. Section 03 3000 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

E. Section 03 3000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.3. REFERENCE STANDARDS


1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Visual Observation Report: For existing floor coverings to be removed.

C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

D. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Product data for recommended remedial coating.
   7. Submit report to Architect.
   8. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

F. Copy of RFCI (RWP).

G. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's statement of compatibility with types of flooring applied over remedial product.
   2. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
3. Manufacturer's installation instructions.

1.6. QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.8. FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1. MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
4. Products:
   a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the
moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring
manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and
floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its
manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's
emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring
without further treatment.
   1. Thickness: As required for application and in accordance with manufacturer's installation
      instructions.
   2. Use product recommended by testing agency.

PART 3  EXECUTION

3.1. CONCRETE SLAB PREPARATION

   A. Follow recommendations of testing agency.
   B. Perform following operations in the order indicated:
      1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
         a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits,
            and other defects.
         b. Removal of existing floor covering.
      2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
         a. Do not attempt to remove coating or penetrating material.
         b. Do not abrade surface.
      3. Preliminary cleaning.
      4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional
         1000 square feet, unless otherwise indicated or required by flooring manufacturer.
      5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless
         otherwise indicated.
      6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise
         indicated.
      7. Specified remediation, if required.
      8. Patching, smoothing, and leveling, as required.
      9. Other preparation specified.
     10. Adhesive bond and compatibility test.
     11. Protection.
C. Remediations:

1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.

2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2. REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3. PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.4. MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.5. INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.6. ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.7. PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.8. ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.9. APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10. PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 0561
SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Metal channel ceiling framing.
D. Acoustic insulation.
E. Gypsum wallboard.
F. Joint treatment and accessories.

1.2. RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

1.3. REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.


N. ASTM E413 - Classification for Rating Sound Insulation; 2016.


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.5. QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.1. GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:

2. Head of Fire Rated Partitions: UL listed assembly No. HW-D-0079, HW-D-0083; 1 hour rating.
3. Fire Rated Structural Column Framing: UL listed assembly No. X528; 1 hour rating.
4. Fire Rated Structural Column Framing: UL listed assembly No. X528; 2 hour rating.
5. Fire Rated Structural Beam Framing: UL listed assembly No. L524; 1 hour rating.
8. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

9. Refer to drawings for additional fire rated assemblies

2.2. METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 10 psf.
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   5. Resilient Furring Channels: 1/2 inch depth, for attachment to substrate through both legs; both legs expanded metal mesh.
      a. Products:
         1) Same manufacturer as other framing materials.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
   4. Deflection and Firestop Track:
      a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
      b. Products:
         1) FireTrak Corporation; Posi Klip.
         2) Metal-Lite, Inc; The System.
         3) Clarkwestern Dietrich Building Systems LLC; Blazframe firestop deflection track.
4) Substitutions: See Section 01 6000 - Product Requirements.

5. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.

2.3. BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Thickness:
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

2.4. ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
   3. Products:
      a. Same manufacturer as framing materials.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
E. **High Build Drywall Surfacer:** Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

F. **Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members:** ASTM C1002; self-piercing tapping screws, corrosion resistant.

G. **Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness:** ASTM C954; steel drill screws, corrosion resistant.

**PART 3 EXECUTION**

3.1. **EXAMINATION**

A. Verify that project conditions are appropriate for work of this section to commence.

3.2. **FRAMING INSTALLATION**

A. **Metal Framing:** Install in accordance with ASTM C754 and manufacturer's instructions.

B. **Suspended Ceilings and Soffits:** Space framing and furring members as indicated.

C. **Studs:** Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. **Partitions Terminating at Ceiling:** Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. **Partitions Terminating at Structure:** Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. **Openings:** Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

3.3. **ACOUSTIC ACCESSORIES INSTALLATION**

A. **Acoustic Insulation:** Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. **Acoustic Sealant:** Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4. **BOARD INSTALLATION**

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. **Single-Layer Non-Rated:** Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.
C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.

2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

3. Level 2: In utility areas, behind cabinery, and on backing board to receive tile finish.

4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.7 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 09 2116
SECTION 09 2236 - LATH

PART 1  GENERAL

1.1. SECTION INCLUDES
   A. Metal lath for adhered masonry stone veneer

1.2. RELATED REQUIREMENTS
   A. Section 04 7000 - Manufactured Stone Veneer: Interior application of adhered masonry stone veneer

1.3. REFERENCE STANDARDS

1.4. SUBMITTALS
   A. See Section 01 3300 - Submittals for submittal procedures.
   B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.
   C. Samples:
      1. Submit two samples, 4 by 4 inch in size illustrating lath material and finish.

PART 2  PRODUCTS

2.1. MANUFACTURERS
   A. Metal Lath and Accessories:

2.2. LATH ASSEMBLIES
   A. Provide completed assemblies with the following characteristics:
      1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.

2.3. LATH
1. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.

2. Weight: 2.5 lb/sq yd.

3. Backed with treated paper.

B. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.

1. Material: Formed sheet steel with rust inhibitive primer, expanded metal flanges.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. INSTALLATION - GENERAL

A. Install interior lath and furring for gypsum plaster in accordance with ASTM C841.

3.3. LATH INSTALLATION

A. Apply lath taut, with long dimension perpendicular to supports.

B. Lap or nest ends of metal lath in accordance with ASTM C841.

C. Secure end laps with tie wire where they occur between supports.

D. Attach lath to wood supports using nails at maximum 6 inches on center.

E. Attach metal lath to metal supports using tie wire at maximum 6 inches on center.

F. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

G. Place corner bead at external wall corners; fasten at outer edges of lath only.

H. Place base screeds at termination of plaster areas; secure rigidly in place.

I. Place 4 inch wide strips of lath centered over junctions of dissimilar backing materials, and secure rigidly in place.

J. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

K. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

L. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.
3.4. TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION 09 2236
SECTION 09 3000 - TILING

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Tile for wall applications.
B. Cementitious backer board as tile substrate.
C. Ceramic trim.
D. Non-ceramic trim.

1.2. RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.3. REFERENCE STANDARDS


N. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.


1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, and setting details.

D. Samples: Full size units of each type and composition of tile and for each color and finish required. For mosaic tile, provide full sheet of each type specified.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.5. QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7. FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.
PART 2  PRODUCTS

2.1.  TILE

A.  Manufacturers:

9.  Substitutions:  See Section 01 6000 - Product Requirements.

B.  Ceramic Mosaic Tile, Type T-1:  Basis of Design: Dal Tile, Ironcraft.

1.  Moisture Absorption:  0 to 0.5 percent as tested in accordance with ASTM C373.
2.  Shape:  Rectangle.
4.  Color(s):  As indicated on drawings.
5.  Pattern:  Random Interlocking Mosaic.
7.  Products:
   a.  Substitutions:  See Section 01 6000 - Product Requirements.


1.  Moisture Absorption:  0 to 0.5 percent as tested in accordance with ASTM C373.
2.  Shape:  Triangle.
3.  Edges:  Square.
5.  Color(s):  As indicated on drawings.
7.  Mounted Sheet Size:  12 by 12 inches.
8.  Products:
   a.  Substitutions:  See Section 01 6000 - Product Requirements.

D.  Glazed Wall Tile, Type T-2, T-17:  Basis of Design: Florida Tile, Genesis.

1.  Moisture Absorption:  0 to 0.5 percent as tested in accordance with ASTM C373.
2. Size: 12 by 24 inch, nominal.
3. Edges: Square.
5. Color(s): As indicated on drawings.
7. Products:
   a. Substitutions: See Section 01 6000 - Product Requirements.

E. Glazed Wall Tile, Type T-5, T-6, T-7: Basis of Design: Valcelunga, Silo.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 4 by 28 inch, nominal.
   3. Edges: Square.
   5. Color(s): As indicated on drawings.
   7. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

F. Glazed Wall Tile, Type T-9, T-21: Basis of Design: Dal Tile, Semi Gloss and Matte.
   1. Moisture Absorption: less than 20 percent as tested in accordance with ASTM C373.
   2. Size: 4 1/4 by 4 1/4 inch, nominal.
   3. Edges: Square.
   5. Color(s): As indicated on drawings.
   7. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

G. Glazed Wall Tile, Type T-12: Basis of Design: Dal Tile, Rittenhouse Square.
   1. Moisture Absorption: less than 20 percent as tested in accordance with ASTM C373.
   2. Size: 3 by 6 inch, nominal.
   3. Edges: Square.
   5. Color(s): As indicated on drawings.
   7. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.
   1. Moisture Absorption: less than 20 percent as tested in accordance with ASTM C373.
   2. Size: 12 by 22 inch, nominal.
   3. Edges: Square.
   5. Color(s): As indicated on drawings.
   6. Trim Units: Matching outside corners shapes in sizes coordinated with field tile.
   7. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

I. Quarry Tile, Type T-19 and T-20: Basis of Design: Dal Tile, Brickwork.
   1. Moisture Absorption: 0.5 to 3.0 percent as tested in accordance with ASTM C373.
   2. Size: 4 by 8 inch, nominal.
   3. Thickness: 7/16 inch, nominal.
   4. Edges: Cushioned.
   5. Color(s): As indicated on drawings.
   6. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

J. Porcelain Tile, Type T-3: Basis of Design: Florida Tile, Nexa.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 24 by 24 inch, nominal.
   3. Thickness: .393 inch.
   4. Edges: Cushioned.
   5. Surface Finish: Matte glazed.
   6. Color(s): As indicated on drawings.
   7. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

K. Porcelain Tile, Type T-8: Basis of Design: Unicom Starker, Icon.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 8 by 7 inch, nominal.
   3. Thickness: 3/8 inch.
   4. Edges: Cushioned.
   6. Color(s): As indicated on drawings.
8. Products:
   a. Substitutions: See Section 01 6000 - Product Requirements.

L. Porcelain Tile, Type T-11: Basis of Design: Marazzi USA, Urban District Mix.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 4 by 28 inch, nominal.
   3. Thickness: 5/16 inch.
   4. Edges: Cushioned.
   5. Surface Finish: Matte glazed.
   6. Color(s): As indicated on drawings.
   7. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

M. Porcelain Tile, Type T-13, T-14, T-16: Basis of Design: Landmark Ceramics, Brickworld.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 3 by 12 inch, nominal.
   3. Thickness: .35 inch.
   4. Edges: Cushioned.
   5. Surface Finish: Matte glazed.
   6. Color(s): As indicated on drawings.
   7. Installation: Offset of no greater than 30 percent.
   8. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

N. Porcelain Tile, Type T-18: Basis of Design: Landmark Ceramics, Timeless.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 8 by 40 inch, nominal.
   3. Thickness: .35 inch.
   4. Edges: Square.
   5. Surface Finish: Matte glazed.
   6. Color(s): As indicated on drawings.
   7. Installation: Offset of no greater than 30 percent.
   8. Products:
      a. Substitutions: See Section 01 6000 - Product Requirements.

O. Natural Stone Tile, Type CS-1:
   1. Composition: Limestone.
   2. Single Tiles:
a. Size: 3-9 inch.


4. Color(s): As indicated on drawings.

5. Reference Section 04 7300 Manufacturered Stone Masonry.

6. Products:
   a. Earthworks, Inc. 4287 N. Highway 51, Perryville, MO 637754. Phone 1-800-887-4555; www.earthworksstone.com; Harvest Mix 3-9" Snapped.

   b. Other acceptable manufacturers:

P. Metal Tile, Type T-10: Basis of Design: Dal Tile, Metallica

1. Composition: Metal wrapped porcelain tile.


5. Surface Finish: Brushed Stainless.


7. Mesh-Mounted Tiles: 3/4 inch (19 mm) nominal, round tiles on 12 by 12 inch nominal mesh backing.

8. Color(s): As indicated on drawings.


2.2. TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.

1. Applications:
   a. Open edges of wall tile.
   b. Wall corners, outside.

2. Manufacturers:
      1) Location: Wall tile exposed edge cap, to terminate tile finish.
      1) Location: Outside corner at tile installations in Mainstreet Corridor 010.
   c. Other acceptable manufacturers:
2.3. SETTING MATERIALS

A. Manufacturers:
   5. Substitutions: See Section 01 6000 - Product Requirements.

   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
      c. TEC, an H.B. Fuller Construction Products Brand; TEC 3N1 Performance Mortar: www.tecspecialty.com/#sle.

2.4. GROUTS

A. Manufacturers:

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for glass, glossy or metal tiles, or joints less than 1/8 inch wide.
   3. Color(s): As selected by Architect from manufacturer's full line.
   4. Products:
2.5. Maintenance Materials

A. Grout Release: Temporary, water-soluble pre-grout coating.
   1. Products:

2.6. ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Thickness: 20 mils, maximum.
   2. Crack Resistance: No failure at 1/16 inch gap, minimum.
   3. Products:
      b. Merkrete, by Parex USA, Inc; Merkrete Fracture Guard: www.merkrete.com/#sle.
      c. Proflex Products, Inc; Maxxim Sim-40: www.proflex.us/#sle.

B. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
   2. Fluid or Trowel Applied Type:
      a. Thickness: 25 mils, minimum, dry film thickness.
      b. Products:
         2) TEC, an H.B. Fuller Construction Products Brand; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
         3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
   1. Products:
      a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com/#sle.
      b. USG Corporation; DUROCK Cement Board.
      c. FinPan, Inc.; ProTEC Concrete Backer Board.
      d. Substitutions: See Section 01 6000 - Product Requirements.
PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. 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 the following limits:
   1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869.
   2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. 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 A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. 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 grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Install thresholds where indicated.
H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4. INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244 using membrane at beverage stations or any areas with a plumbing fixture.

3.5. CLEANING

A. Clean tile and grout surfaces.

3.6. PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 3000
SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Suspended metal grid ceiling system.
B. Acoustical units.

1.2. RELATED REQUIREMENTS

A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.
B. Section 23 3700 - Air Outlets and Inlets: Air diffusion devices in ceiling.
C. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.
D. Section 28 4600 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.3. REFERENCE STANDARDS

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
I. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
B. Do not install acoustical units until after interior wet work is dry.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data on suspension system components.

C. Samples: Submit two samples 6 inch in size illustrating material and finish of acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.6. QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.

B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7. FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Acoustic Tiles/Panels:
   3. USG; : www.usg.com/#sle.

B. Suspension Systems:
   3. USG; : www.usg.com/#sle.

2.2. ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
   1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.
   2. VOC Content: Certified as Low Emission by one of the following:
      a. Product listing in UL (GGG).
B. Acoustical Tile Type ACT-1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:

1. Size: 24 by 24 inches.
2. Thickness: 3/4 inches.
4. Light Reflectance: not less than 0.80 percent, determined in accordance with ASTM E1264.
5. NRC Range: 0.70 to 0.75, determined in accordance with ASTM E1264.
6. Articulation Class (AC): 190, determined in accordance with ASTM E1111.
7. Ceiling Attenuation Class (CAC): not less than 33, determined in accordance with ASTM E1264.
10. Surface Pattern: Fine textured visual.
11. Antimicrobial Treatment: Shield Manufacturer’s standard anti mold / mildew.
12. Suspension System: Exposed grid Type SS-1.
13. ACT-1 Products:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide Eclipse Clima Plus (Item No. 76775), SLT Lay-in as manufactured by USG Interiors, www.usg.com
   b. Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Armstrong World Industries, Inc; www.armstrong.com
      2) CertainTeed Corporation; www.certainteed.com

2.3. SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635 Heavy Duty.

1. Components: Main beams and cross tees In accordance with the International Building Code, Section 1621 for Category D, E and F as described in ESR-1308.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. In accordance with the International Building Code, Section 1621 for Category D, E, and F.

E. Wall Moldings: In accordance with the International Building Code, Section 1621 for Category D, E. and F or method as described in ESR-1308.
1. Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

2. Nominal 15/16 inch x 15/16 inch hemmed, pre-finished angle molding

F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch-diameter wire.

G. Seismic Accessories:
1. Seismic Perimeter Clip - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding. The clip is compatible with 15/16 inch and 9/16 inch grid systems.
2. SST Seismic Separation Tee - Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint. The clip is compatible with 15/16 inch and 9/16 inch grid systems.
3. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
4. Seismic Spacer Bar - Seismic, hot-dipped galvanized cold-rolled steel per ASTM A568. Manufacturer's standard spacer bar designed to accommodate seismic forces. The spacer bar is compatible with 15/16 inch and 15/16 inch grid systems.

H. Exposed Steel Suspension System Type SS-1: Formed steel, commercial quality cold rolled; heavy-duty.
1. Profile: Tee; 15/16 inch wide face.
2. Construction: Double web.
4. SS-1 Products:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide USG Donn Brand DX/DXL Heavy Duty Acoustical Suspension System as manufactured by USG Interiors,www.usg.com
   b. Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Armstrong World Industries, Inc; www.armstrong.com
      2) CertainTeed Corporation; www.certainteed.com

2.4. ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.
PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Comply with seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook." IBC Category D installation requirements.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

G. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

J. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

K. Do not eccentrically load system or induce rotation of runners.

L. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

M. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.
B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

H. Where round obstructions occur, provide preformed closures to match perimeter molding.

I. Install hold-down clips on panels within 20 ft of an exterior door.

J. Install safety clips on wood veneer panels 2 inches from outside edge of panel and at 24 inches on center.
   1. Use wire ties to attach safety clips.

3.4. TOLERANCES

   A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

   B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 5100
SECTION 09 6500 - RESILIENT FLOORING

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Installation accessories.

1.2. RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

C. Section 09 6813 - Tile Carpeting.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 8 by 10 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Concrete Testing Standard: Submit a copy of ASTM F710.

F. Concrete Sub-floor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 5 percent or not less than one full carton of each type and color.
   3. Extra Wall Base: 5 percent or not less than 1 full carton of each type and color.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.7. FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1. SHEET FLOORING

A. Vinyl Sheet Flooring - Type SV-3: Homogeneous without backing, with color and pattern throughout full thickness.
1. Manufacturers:

2. Other acceptable manufacturers:
   c. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.


4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.

5. Sheet Width: 49 inch minimum.

6. Static Load Resistance: 250 psi minimum, when tested as specified in ASTM F970.


8. Color: As indicated on drawings.

B. Vinyl Sheet Safety Flooring - SV-1: Transparent or translucent vinyl wear layer over interlayer and backing.

1. Manufacturer:

2. Other acceptable manufacturers:
   c. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 substitution form.

3. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.

4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.

5. Wear Layer Thickness: 0.020 inch minimum.

6. Total Thickness: 0.080 inch minimum.

7. Sheet Width: 79 inch minimum.

8. Static Load Resistance: 2500 psi minimum, when tested as specified in ASTM F970.


10. Static Coefficient of Friction: .79 dry .94 wet.

11. Color: As indicated on drawings.

12. Integral coved base with cap strip.

C. Vinyl Sheet Sports Flooring - SV-2: Transparent or translucent vinyl wear layer over interlayer and backing.
1. Manufacturers:

2. Other acceptable manufacturers:
   c. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

3. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.

4. Wear Layer Thickness: 0.028 inch minimum.

5. Total Thickness: 0.28 inch minimum.


8. Color: As indicated on drawings.

D. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.2. TILE FLOORING

A. Vinyl Tile (LVT-1, LVT-7): Printed film type, with transparent or translucent wear layer.
      a. Substitutions: Not permitted.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
   5. Wear Layer Thickness: No less than .028 inch.
   6. Total Thickness: .0120 inch.
   7. Color: As indicated on drawings.

B. Vinyl Tile (LVT-2, LVT-4, LVT-5): Printed film type, with transparent or translucent wear layer.
      a. Substitutions: Not permitted.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
   5. Wear Layer Thickness: No less than .028 inch.
   6. Total Thickness: .0120 inch.
C. Vinyl Tile (LVT-3, LVT-6): Printed film type, with transparent or translucent wear layer.
      a. Substitutions: Not permitted.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
   4. Tile Size: 12 by 24 inch.
   5. Wear Layer Thickness: No less than .028 inch.
   6. Total Thickness: .0120 inch.
   7. Color: As indicated on drawings.

2.3. RESILIENT BASE

A. Resilient Base (RB-1): ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
   3. Height: 4 inch.
   4. Thickness: 0.125 inch.
   5. Finish: Satin.
   7. Color: To be selected by Architect from manufacturer's full range.

B. Molded Wall Base (MB-1): ASTM F 1861, Type TP rubber, thermoplastic.
   1. Manufacturers:
      d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
UPGRADES AND RENOVATIONS CAPE GIRARDEAU VETERANS HOME

3. Height: 6 inch.
4. Length: 8 feet.
5. Thickness: 1/4 inch.
6. Color: As indicated on drawings.
7. Corners: Mitered, field cut.

C. Molded Wall Base (MB-2): ASTM F 1861, Type TP rubber, thermoplastic.
   1. Manufacturers:
      d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
   3. Height: 8 inch.
   4. Length: 8 feet.
   5. Thickness: 1/4 inch.
   6. Color: As indicated on drawings.
   7. Corners: Mitered, field cut.

2.4. ACCESSORIES

A. Moldings, Transition and Edge Strips: Same material as flooring.
   1. Manufacturers:
      d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

2. Colors: As selected by Architect from manufacturer's full range of colors.

B. Filler for Coved Base: Plastic.

C. Cap for Coved Base: Stainless.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

C. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

D. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

E. Prohibit traffic until filler is fully cured.

F. Clean substrate.

3.3. Installation - General

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

F. Install flooring in recessed floor access covers, maintaining floor pattern.

G. At movable partitions, install flooring under partitions without interrupting floor pattern.

H. Spread only enough adhesive to permit installation of materials before initial set.
   1. Fit joints and butt seams tightly.

I. Set flooring in place, press with heavy roller to attain full adhesion.

J. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

K. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.
M. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4. Installation - Sheet Flooring

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Seal seams by heat welding where indicated.

C. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.5. Installation - Tile Flooring

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install tiles and planks in pattern as indicated on drawings.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.6. Installation - Resilient Base

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners of cove wall base. At external corners, use premolded units. At exposed ends, use premolded units.

C. Miter internal and external corners of molded wall base.

D. Install base on solid backing. Bond tightly to wall and floor surfaces.

E. Scribe and fit to door frames and other interruptions.

3.7. CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.8. PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 6500
SECTION 09 6813 - TILE CARPETING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Carpet tile.

1.2. RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

C. Section 09 6500 - Resilient Flooring.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit one carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Concrete Sub-floor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.
1.5. QUALITY ASSURANCE

   A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

   B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

1.6. FIELD CONDITIONS

   A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

   A. Tile Carpeting:


      2. Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:

         a. Tandus Centiva
         b. Bently Mills, Inc.
         c. Shaw Contract.

2.2. MATERIALS

   A. Tile Carpeting (CPT-1); Types specified on interior drawings flooring finish schedule: Tufted, Manufactured in one color dye lot.

      2. Tile Size: 18 by 36 inch, nominal.
      3. Color: As indicated on drawings.
      4. Yarn System: 100% solution dyed, Econyl Type 6 Nylon.
      5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
      7. Stitches: 10 per inch.
      8. Pile Weight: 36 oz/sq yd.

   B. Tile Carpeting (CPT-2); Types specified on interior drawings flooring finish schedule: Tufted, Manufactured in one color dye lot.

      2. Tile Size: 24 by 24 inch, nominal.
3. Color: As indicated on drawings.
4. Yarn System: 100% solution dyed, Econyl Type 6 Nylon.
5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
7. Stitches: 8.33 per inch.

C. Tile Carpeting (CPT-3); Types specified on interior drawings flooring finish schedule: Tufted, Manufactured in one color dye lot.
   2. Tile Size: 24 by 24 inch, nominal.
   3. Color: As indicated on drawings.
   4. Yarn System: 100% solution dyed, Econyl Type 6 Nylon.
   5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   7. Stitches: 8.33 per inch.

D. Tile Carpeting (CPT-4); Types specified on interior drawings flooring finish schedule: Tufted, Manufactured in one color dye lot.
   2. Tile Size: 24 by 24 inch, nominal.
   3. Color: As indicated on drawings.
   4. Yarn System: 100% solution dyed, Econyl Type 6 Nylon.
   5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   7. Stitches: 8.33 per inch.
2.3. ACCESSORIES

A. Edge Strips: Rubber, color as selected by Architect.

B. Adhesives:
   1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
   1. Test in accordance with Section 09 0561.
   2. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   3. "Anhydrous Calcium Chloride Test" Subparagraph below is based on CRI's "CRI Carpet Installation Standard" and on floor-covering industry practices for adhered floor coverings to avoid adhesive failures.
      a. 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. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
      c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
   4. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.
3.3. INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

C. Installation Method: As recommended in writing by carpet tile manufacturer:

D. Install carpet tile in accordance with manufacturer's instructions.

E. Blend carpet from different cartons to ensure minimal variation in color match.

F. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

G. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

H. Locate change of color or pattern between rooms under door centerline.

I. Trim carpet tile neatly at walls and around interruptions.

J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

K. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

L. Complete installation of edge strips, concealing exposed edges.

M. Protect carpet tile 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 tile manufacturer.

3.4. CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 09 6813
SECTION 09 9000 - PAINTING AND COATING - COMMERCIAL GUIDE SPEC

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Surface preparation and field painting of exposed interior items and surfaces.

B. Surface preparation and field painting of exposed exterior items and surfaces.

C. Painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

1.2. RELATED Requirements

A. Section 08 1113 - Hollow Metal Doors and Frames.

1.3. DEFINITIONS

A. General: Standard coating terms defined in ASTM D16.

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. Semi-Gloss 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.

B. Environments: The following terms distinguish between different corrosive exposures:

1. "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.

2. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.

3. "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.4. REFERENCE Standards


B. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: For each paint system indicated, including:
   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. Preparation instructions and recommendations.
   3. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inch square, representing actual product, color, and patterns.

1.6. QUALITY ASSURANCE

A. Installer 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. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Paint exposed surfaces. 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.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
   2. Finish areas designated by Architect.
   3. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   4. Refinish mock-up area as required to produce acceptable work.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F. Maintain storage containers in a clean condition, free of foreign materials and residue.
1.8. PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 degrees F and 90 degrees F.

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 degrees F and 95 degrees F.

D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.9. 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.

B. Quantity: Furnish Owner with an additional three percent, but not less than 1 gallon or 1 case, as appropriate, of each material and color applied.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Basis of Design Manufacturer: Sherwin Williams Co.; www.sherwin-williams.com; Contact: Hank Meinking, 314-281-7485; Email: Hank.Meinking@sherwin.com

B. Other Acceptable Manufacturers:


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. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that meet the applicable local, state or federal VOC requirements.

C. Color: Refer to Finish Schedule and Paint Legend for paint colors.

2.3. INTERIOR PAINT SYTEMS

A. Gypsum Board:

1. Acrylic Finish: Two finish coats over a primer.
a. Eggshell Finish:
      (a) Applied at a dry film thickness of not less than 1.4 mils.
      (a) Applied at a dry film thickness of not less than 1.4 mils.
   3) Locations: General use, unless noted otherwise.

b. Flat Finish:
      (a) Applied at a dry film thickness of not less than 1.4 mils.
   2) Flat Finish: Sherwin Williams, ProMar 200 Zero VOC Interior Latex, Flat.
      (a) Applied at a dry film thickness of not less than 1.5 mils.
   3) Locations: Ceilings.

c. Semi-Gloss Finish:
      (a) Applied at a dry film thickness of not less than 1.4 mils.
      (a) Applied at a dry film thickness of not less than 1.4 mils.
   3) Locations: Wet Areas (locations with plumbing fixtures), Resident Rooms, Serving Line

B. Painted Wood; Doors, Frames, Trim, or Chair Rails:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Semi-Gloss Finish:
         1) Primer: Sherwin Williams, Premium Wall and Wood Primer.
            (a) Applied at a dry film thickness of not less than 1.6 mils.
         2) Semi-Gloss Finish: Sherwin Williams, Pro Industrial Acrylic.
            (a) Applied at a dry film thickness of not less than 2.0 mils.

C. Ferrous and Non-Ferrous Metal:
   1. Acrylic Epoxy Finish: Two finish coats over a primer.
      a. Semi-Gloss Finish:
         1) Primer: Sherwin Williams, Pro Industrial Pro-Cryl Universal Primer.
            (a) Applied at a dry film thickness of not less than 2.0 mils.
         2) Semi-Gloss Finish: Sherwin Williams, Pro Industrial Pre-Catalyzed Waterbased Epoxy.
            (a) Applied at a dry film thickness of not less than 2.0 mils.
2.4. EXTERIOR PAINT SYSTEMS

A. Ferrous and Non-Ferrous Metals for High Performance Finish:
   1. Primer is not required on shop-primed items.
   2. High Performance Finish: Two finish coats over a rust-inhibitive primer.
      a. Semi-Gloss Finish:
         1) Primer (if required): Sherwin Williams, Pro Industrial Pro-Cryl Primer.
            (a) Applied at a dry film thickness of not less than 2.0 mils.
            (a) Applied at a dry film thickness of not less than 2.0 mils.

B. Wood - Siding, Trim, and Other Smooth Exterior Wood Surfaces:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Satin Finish:
         1) Primer: Sherwin Williams, Premium Wall and Wood Primer.
            (a) Applied at a dry film thickness of not less than 1.6 mils.
            (a) Applied at a dry film thickness of not less than 1.4 mils.

PART 3 EXECUTION

3.1. EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. 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.
   2. If a potential incompatibility of primers applied by others exists, obtain the following from the primer applicator before proceeding:
      a. Confirmation of primer's suitability for expected service conditions.
      b. Confirmation of primer's ability to be top coated with materials specified.

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 substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. 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 to prepare surfaces.
      a. Use abrasive blast-cleaning methods if recommended by coating 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 coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
   3. Wood Substrates: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Smoothly sand surfaces exposed to view 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.
      b. Immediately on delivery, prime edges, ends, faces, undersides, and backsides of wood to be coated.
      c. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   4. Ferrous Metal Substrates: 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 recommendations.
      a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 6.
      b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
      c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
   5. Non-Ferrous Metal Substrates: Clean non-ferrous and galvanized surfaces according to manufacturer's written instructions for the type of service, metal substrate, and application required.
      a. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.

3. Use only the type of thinners approved by manufacturer and only within recommended limits.

4. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

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.

B. General: Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques best suited for the material being applied.

2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.

3. Coating surface treatments and finishes are indicated in the coating system descriptions.

4. Provide finish coats compatible with primers used.

5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, 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.

C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. The number of coats and film thickness required is the same regardless of application method.

2. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4. CLEANING

A. After completing painting, clean glass and paint spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5. 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.

C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 9000
SECTION 10 1400 - SIGNAGE

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Room and door signs.
B. Interior directional and informational signs.
C. Emergency evacuation maps.

1.2. REFERENCE STANDARDS


1.3. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.
D. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.4. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.
B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.6. FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2  PRODUCTS

2.1. MANUFACTURERS

A. All interior sign types to be provided by one single vendor.


C. Other acceptable manufacturers:
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.2. SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 , unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign in locations as indicated on drawings.
   1. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   2. Character Height: Minimum 5/8 inch.
   3. Sign Height: As indicated on drawings.
   4. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
   5. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   6. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   7. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.
   2. Sizes: As indicated on drawings.
   3. Wording of signs to be verified by Owner and Architect prior to order and fabrication.

D. Specialty Signage:
1. Provide all signage for "Mainstreet" business as indicated on drawings. Secure specialty (non-standard sign) materials as labeled and fabricate off site. Sign to arrive on site as one unit and shall be installed complete.

2. Sizes: As indicated on drawings.

E. Emergency Evacuation Maps:
   1. Allow for one map per wing and as indicated on drawing.
   2. Map content to be provided by Owner.
   3. Sizes: As indicated on drawings.

F. Other Dimensional Letter Signs: Wall and specialty panel mounted.
   1. Interior: Provide dimensional letters, cut plastic laminate with metal finish.
   2. Sizes: As indicated drawings.

2.3. SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
      a. Tactile Signs: Helvetica, Arial or other sans serif font.
      b. Non-Tactile/Specialty Signs: Angsana New, or similar decorative/serif font.
   2. Character Case: Upper and lower case (title case).
   3. Background Color: To be selected by Architect from manufacturer's full range of colors and finishes.
   4. Character Color: Contrasting color, to be selected by Architect from manufacturer's full range of colors and finishes.

2.4. TACTILE SIGNAGE MEDIA

A. Injection Molded Panels (S-1): Two-piece acrylic plastic, with raised letters and braille.
   1. Product: ASI Signage, 'InTouch'; Room ID Sign with One Visible Window for Insert.
   2. Total Thickness: 1/4 inch.

B. Injection Molded Panels (S-2): One-piece acrylic plastic, with raised pictogram, letters and braille.
   2. Total Thickness: 1/8 inch.

C. Injection Molded Panels (S-3): One-piece acrylic plastic, with custom graphic/logo, raised letters and braille.
2. Total Thickness: 1/8 inch.

D. Injection Molded Panels (S-5): Two-piece acrylic plastic, with raised letters and braille.
1. Product: ASI Signage, 'InTouch'; Room ID Sign with Two Visible Window for Inserts.
2. Total Thickness: 1/4 inch.

E. Injection Molded Panels (S-6): Layered acrylic plastic, with raised letters and braille.
1. Product: ASI Signage, 'InTouch'; Conference Room Sign with Centered Opening for 'Vacant/In Use' Slide.
2. Total Thickness: 3/8 inch.

F. Injection Molded Panels (S-7): One-piece acrylic plastic, with raised letters and braille.
1. Product: ASI Signage, 'InTouch'; Room ID Sign for back of house areas.
2. Total Thickness: 1/8 inch.

2.5. NON-TACTILE SIGNAGE MEDIA

A. Injection Molded Panels (S-9): Two-piece acrylic plastic frame.
1. Product: ASI Signage, 'InTouch'; Room Evacuation Sign, with frame, large visible window and thumb notch for 8-1/2 x 11-inch paper insertion/removal.
2. Total Thickness: 1/4 inch.

B. Injection Molded Panels (S-10): Two-piece acrylic plastic, with raised letters and braille.
2. Total Thickness: 1/8 inch.

2.6. SPECIALTY SIGNAGE

A. Cut Out Letters and Panels (S-8 Cape Dining):
1. Product: ASI Signage, Custom SignEtch; Wood backer board with brushed aluminum panel, dimensional letters and metal standoffs.
   a. Wood: 1/4 inch thick, 2 feet diameter; painted finish: Black.
   b. Brushed Aluminum Panel: Alloy 3003, 1 foot 11 inch diameter, 1/8 inch thick, brushed finish, smooth edges.
   c. Letters: Cut out from aluminum face panel to expose backer panel behind; "Cape" (12 inches high); "Dining" (4 inches high).
   d. Hardware: 1 inch round, 7/16 inch deep metal standoff, black finish. Basis of design Grainger Standoff Caps, Round, #ZA0252-ALBLK.

B. Dimensional Letters and Wood Panel (S-4 Library):
1. Product: ASI Signage, Custom Sign; Wood panel with dimensional letters and metal standoffs.
   a. Wood: 1/4 inch thick, 8 feet by 1'-10"; Maple species, stained and varnished to match Architect's sample.
   b. Letters: ASI Signage; Metal Laminate Cut Letters.
c. Hardware: 1-1/2 inch round, 1/2 inch deep metal standoff, brushed aluminum or stainless finish. Basis of design Grainger Standoff Caps, Round, #ZA0261-SS32D.

C. Dimensional Letters and Metal Panel (S-4 Bistro):
   1. Product: ASI Signage, Custom Sign; Metal panel with dimensional letters and metal standoffs.
      a. Metal Panel: 6 foot 4 inch by 1 foot 10 inch, CorTen weathering steel, smooth edges.
      b. Letters: ASI Signage; Metal Laminate Cut Letters.
      c. Hardware: 1-1/2 inch round, 1/2 inch deep metal standoff, brushed aluminum or stainless finish. Basis of design Grainger Standoff Caps, Round, #ZA0261-SS32D.

D. Dimensional Letters and Panel (S-4 Bank):
   1. Product: ASI Signage, Custom Sign; Wood panel with dimensional letters.
      a. Wood: 1/2 inch thick, 6 feet by 1 foot 6 inch; Oak species, painted finish to be selected by Architect.
      b. Letters: ASI Signage; Metal Laminate Cut Letters.
      c. Hardware: Concealed.

E. Dimensional Letters and Panel (S-4 Canteen):
   1. Product: ASI Signage, Custom Sign; Metal panel with wood frame and dimensional letters.
      a. Panel #1 (Est. Date): 1-1/2 inch thick reclaimed wood frame, varnished; 5 feet by 1 foot 10 inch.
      b. Panel #2 (Name): 1-1/2 inch thick reclaimed wood frame, varnished; 16 feet by 1 foot 10 inch.
      c. Corrugated Metal Panel: Reclaimed and weathered; staggered seams as required for desired length.
      d. Letters: ASI Signage; Metal Laminate Cut Letters.
      e. Hardware: Concealed.

2.7. DIMENSIONAL LETTERS

A. Laminate Letters (S-4 Country Kitchen):
   1. Materials: Copper Laminate.
   3. Mounting: Vertical, secured to plate; plate to be concealed after mounting.
   4. Sizes: As indicated on drawings.
   5. All exposed sides of letters to be finished with face laminate.

B. Laminate Letters (S-11 Resident Wings):
   4. Sizes: As indicated on drawings.
2.8. ACCESSORIES

   A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
   B. Exposed Screws: As indicated.
   C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1. EXAMINATION

   A. Verify that substrate surfaces are ready to receive work.

3.2. INSTALLATION

   A. Install in accordance with manufacturer's instructions.
   B. Install neatly, with horizontal edges level.
   C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
   D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION 10 1400
SECTION 10 2239 - FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

1.2. REFERENCE STANDARDS


F. ASTM E413 - Classification for Rating Sound Insulation; 2016.


H. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.3. ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.

1. Require attendance by representatives of installer.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

F. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.
G. Manufacturer's Instructions: Indicate special procedures and perimeter conditions requiring special attention.

H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
   b. Flame-Spread Index: 25 or less.
   c. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.

D.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.7. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within five year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening:

B. Other Acceptable Manufacturers:
2.2. FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Panel Partitions: Side opening; paired panels; side stacking; manually operated.

B. Panel Construction:
   1. Frame: 16 gage, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
   2. Substrate: Gypsum board.
   4. Low profile hinges on basic panels shall be of steel and project no more than 1/4” beyond panel faces. Each pair of panels to have a minimum of three hinges.
   5. Hardware: Latching door handles of cast steel, satin chrome finish; pull bars.
   6. Panel Properties:
      a. Thickness With Finish: 3 inches.
      b. Width: Equal widths.
      c. Weight: 10 lb/sq ft.

C. Panel Finishes:
   2. Exposed Metal Trim: Custom powder coated paint finish.

D. Panel Seals:
   1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
   2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:
   1. Suspension Tracks: Steel or aluminum mounted directly to overhead structural support, with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
   2. Carriers: Steel, ball bearing wheels on trolley carrier at top of every panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Performance:
   1. Acoustic Performance:
      a. Sound Transmission Class (STC): 38 to 42 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
   2. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
G. Accessories:
   1. Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and
      attachments, and intermediate meeting posts.
   2. Pocket Enclosures: Door, frame, and trim to match adjacent panels.
   3. Acoustic Sealant: As recommended by partition manufacturer.

2.3. MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch thick, maximum permissible length; ends
   square cut, square edges.
C. Vinyl Coated Fabric: ASTM F793/F793M, Category VI, polyvinyl fluoride (PVC) finish for washability
   and improved flame retardance; color as selected by Architect from manufacturer’s standard range.
D. Acoustic Insulation:
   1. Type: As required for acoustic performance indicated.
   2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required
   position and parallel to the floor surface.
C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.
D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.2. INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.
B. Fit and align partition assembly level and plumb.
C. Lubricate moving components.
D. Install acoustic sealant to achieve required acoustic performance.
E. Coordinate electrical connections.

3.3. ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-
   compress acoustic seals.
B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
C. Adjust partition assembly to achieve lightproof seal.
3.4. CLEANING
   A. Clean finish surfaces and partition accessories.

3.5. CLOSEOUT ACTIVITIES
   A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION 10 2239
SECTION 10 2600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Bumper rails.
B. Protective corridor handrails.
C. Corner guards.
D. Protective wall covering.
E. Door frame protection.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.
B. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.
B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.
D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, bumper rails, and protective corridor handrails, 24 inches long.
   2. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches square.
3. Submit two full-size samples of door edge protectors.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Stock Materials: Three units minimum 96 inches long unit of each kind of covers for corner guards, bumper rails, and protective corridor handrails.

H. Maintenance Data: For each type of product. Include information regarding recommended and potentially detrimental cleaning materials and methods.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in conformance with manufacturer's recommendations for each type of item.

D. Store products in either horizontal or vertical position, in conformance with manufacturer's instructions.

1.6. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer and installer warranty for metal crash rails.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Crash Rails, Protective Corridor Handrails, and Corner Guards:

B. Protective Wall Covering:

C. Plastic Door, Frame, and Knob/Lever Protection:
2. Inpro; www.inprocorp.com/#sle.


2.2. PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for conformance to applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance conforming to applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.3. PRODUCT TYPES

A. Bumper Guard (BG-1): Factory- or shop-fabricated, with continuous aluminum retainer, preformed end caps and internal and external corners:


2. Performance of Installed Assembly:
   a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
   b. Resist lateral force of 250 lbs at any point without damage or permanent set.

3. Material: Polyethylene terephthalate (PET or PETG); PVC-free, color solid, as indicated on drawings.

4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

5. Mounting: Surface.


7. Return rail to wall.

B. Protective Corridor Handrails (HR-1 and HR-2): Factory- or shop-fabricated, with preformed end caps and internal and external corners:


2. Comply with accessibility requirements of ICC A117.1 and ADA Standards.

3. Performance of Installed Assembly:
   a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
   b. Resist lateral force of 250 lbs at any point without damage or permanent set.

4. Material: Polyethylene terephthalate (PET or PETG); PVC-free, color wood grain, as indicated on drawings.

5. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

7. Projection From Wall to Outside of Rail: 3 inch.
9. Return rail to wall.

C. High Impact Corner Guards - Surface Mounted (CG-1):
2. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Width of Wings: 3 inches.
7. Color: As indicated on drawings.
8. Length: One piece.
9. Height: 3 feet.

D. Corner Guards - Surface Mounted, Three Dimensional (CG-2):
2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Corner: Square.
6. Color: As indicated on drawings.
7. Projection From Wall to Outside of Guard: 1/2 inch.
8. Height: As indicated on drawings.

E. Corner Guards - Surface Mounted, Three Dimensional (CG-3, CG-4 and CG-5):
2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Width of Wings: 2 inches.
5. Corner: Square.
6. Color: As indicated on drawings.
7. Projection From Wall to Outside of Guard: 3/8 inch.
8. Height: As indicated on drawings.

F. Three Dimensional Trim - Surface Mounted, Molded (CR-1, CR-2, CR-3 and CR-4)
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Projection From Wall to Outside of Guard: 1/2 inch.
   5. Color: As indicated on drawings.
   6. Height: 2 inches.

G. Three Dimensional Trim - Surface Mounted, Molded (TR-1)
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Projection From Wall to Outside of Guard: 5/8 inch.
   5. Color: As indicated on drawings.
   6. Height: 6 inches.

H. Three Dimensional Trim - Surface Mounted, Molded (TR-2, TR-3, TR-5):
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Projection From Wall to Outside of Guard: 1/2 inch.
   5. Color: As indicated on drawings.
   6. Height: 6 inches.

I. Three Dimensional Trim - Surface Mounted, Molded (TR-4):
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Projection From Wall to Outside of Guard: 1/2 inch.
   5. Color: As indicated on drawings.
   6. Height: 8 inches.
J. Three Dimensional Trim - Surface Mounted, Molded (TR-6, TR-7):
   2. Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Projection From Wall to Outside of Guard: 3/8 inch.
   5. Color: As indicated on drawings.
   6. Height: 2 inches.

K. Protective Wall Covering (WP-1, WP-3, WP-6):
   1. Basis of Design: CS Acrovyn, Acrovyn By Design
   2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
   3. Thickness: 0.040 inch.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Color: As indicated on drawings.
   6. Pattern: As indicated on drawings.

L. Protective Wall Covering (WP-2, WP-8, WP-9, WP-10 and WP-11):
   2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
   3. Thickness: 0.040 inch.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Color: As indicated on drawings.
   6. Pattern: As indicated on drawings.

M. Protective Wall Covering (WP-4 and WP-5):
   2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
3. Thickness: 0.040 inch.
4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Color: As indicated on drawings.
6. Pattern: Solid and Chameleon, as indicated on drawings.

N. Protective Wall Covering (WP-7 and WP-12):
   2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
   3. Thickness: 0.040 inch.
   4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   5. Color: As indicated on drawings.

O. Doorway Protection:
   1. Frames Protection (DFG-1): Formed to fit frame profile.
      b. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
      c. Profile: One-piece.
      d. Configuration: For wall-return frames.
      e. Thickness: 0.040 inch.
      f. Length at Hanging Jamb: 36 inches.
      g. Length at Latching Jamb: 36 inches.
      h. Color: As indicated on drawings.
      i. Mounting: Adhesive.

2.4. FABRICATION
   A. Fabricate components with tight joints, corners and seams.
   B. Pre-drill holes for attachment.
C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

   1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

D. Start of installation constitutes acceptance of project conditions.

3.2. INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position top of bumper rail at 16 inches from finished floor.

C. Position top of corridor hand rail at 34 inches from finished floor.

D. Position corner guard above wall base to height as indicated on drawings.

E. Terminate rails 1 inch short of door openings and intersecting walls.

F. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.

   1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.

   2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.

   3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.

   4. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.3. TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.4. CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 10 2600
SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Utility room accessories.

1.2. REFERENCE STANDARDS


B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.


F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.


1.3. ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.
1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

B. Under-Lavatory Pipe Supply Covers:
   1. Plumberex Specialty Products, Inc; Pro-Extreme:  www.plumberex.com/#sle.
   2. IPS Corporation; Trubro Lav Guard 2 Undersink Pipe Covers: www.ipscorp.com/plumbing/truebro
   3. Keeney Manufacturing Company; www.keeneymfg.com ADA Compliant Undersink Rubber Pipe Trap Wrap

2.2. MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.


F. Zinc Alloy: Die cast, ASTM B86.

G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

H. Adhesive: Two component epoxy type, waterproof.

I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
J. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3. FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

E. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

F. Back paint components where contact is made with building finishes to prevent electrolysis.

2.4. Commercial Toilet Accessories

A. Toilet Paper Dispenser: single roll, surface mounted, Unit shall accommodate one standard-core toilet paper roll up to 5-1/2" (140mm) diameter (1800 sheets). Support arms shall be 22-gauge (0.8mm) and equipped with concealed, 16-gauge (1.6mm) mounting brackets that are secured to concealed, 16-gauge (1.6mm) wall plates with stainless steel setscrews. *Spindle shall be chrome-plated plastic with a heavy-duty internal spring.

1. Products:
   a. Bobrick; Model B-6857. www.bobrick.com
   b. American Specialties, Inc. Model 7305-S.
   d. Substitutions: Section 01 6000 - Product Requirements.

B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock. Satin-finish stainless steel. Dispenses 400 C-fold or 525 multifold towels. Door has tumbler lock and piano-hinge. Hemmed towel tray opening. Unit 10 3/4" W, 14" H, 4" D (275 x 355 x 100mm).

1. Capacity: 400 multifold minimum.

2. Products:
   b. American Specialties, Inc. Model 0210..
   c. Bradley Corporation; Model 250-15: www.bradleycorp.com..

C. Soap Dispenser: Bag-In-Box Liquid soap dispenser, wall-mounted, surface, with impact resistant polymer cover and Valve dispenses all-purpose hand soaps, removable for easy maintenance. Lid has concealed locking device. Concealed wall/mirror mounting. Wall to push-button, 4" (100mm). Design intent is for new to match existing.


2. Products:
a. Georgia-Pacific Professional; GP PRO MANUAL UNIVERSAL DISPENSER, GRAY
   www.blue-connect.com/#sle.

b. GOJO® 5150-06 FMX-12 1250 mL Dove Gray Manual Hand Soap Dispenser

c. DIAL® DISPENSER - FOR 800ML BAG-IN-BOX


D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036. One-piece, 1/2" x 1/2" x 3/8" (13 x 13 x 9.5mm) channel-frame. Type 304 stainless steel with bright-polished finish. Mitered corners. Frame screw permits easy replacement of glass. No. 1 quality, 1/4" (6mm) glass mirror; warranted against silver spoilage for 15 years. Galvanized steel back. Secured to concealed wall hanger with theft-resistant mounting.

1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.

2. Size: 24"x36".

3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

5. Products:
   b. American Specialties, Inc.; Model 0620-2436.

E. Grab Bars: Stainless steel, smooth surface. 1-1/4" (32mm) dia. tubing. Constructed of 18-gauge (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 3 1/8" H (50 x 80mm), with screw holes for concealed anchors. Cover is 22-gauge (0.8mm), type 304 stainless steel with satin finish, 3 1/4" (85mm) diameter. Cover snaps over mounting flange to conceal screws.

1. Standard Duty Grab Bars:
   a. Push/Pull Point Load: 250 pound-force, minimum.
   b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   c. Finish: Satin.
   d. Length and Configuration: As indicated on drawings.

2. Products:
   b. American Specialties, Inc.; Series 3700

2.5. UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.

2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.

3. Construction: 1/8 inch flexible PVC.
   a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   b. Comply with ASTM C1822, type indicated.
   c. Comply with ASME A112.18.9.
   d. Comply with ICC A117.1.


5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

6. Products:
   b. IPS Corporation; Trubro Lav Guard 2 Undersink Pipe Covers: www.ipscorp.com/plumbing/truebro
   c. Keeney Manufacturing Company; www.keeneymfg.com ADA Compliant Undersink Rubber Pipe Trap Wrap

PART 3  EXECUTION

3.1. EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify exact location of accessories for installation.
   C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
   D. Verify that field measurements are as indicated on drawings.
   E. See Section Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.2. PREPARATION
   A. Deliver inserts and rough-in frames to site for timely installation.
   B. Provide templates and rough-in measurements as required.

3.3. INSTALLATION
   A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
   B. Install plumb and level, securely and rigidly anchored to substrate.
   C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
1. Grab Bars: As indicated on drawings.

3.4. PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 2800
SECTION 10 3100 - MANUFACTURED FIREPLACES

PART 1 GENERAL

1.1. SECTION INCLUDES

   A. Manufactured steel box gas insert fireplace.
   B. Insulated chimney flue and associated roof flashings.

1.2. RELATED REQUIREMENTS

   A. Section 23 1123 - Facility Natural-Gas Piping: Gas piping to fire box.
   B. Section 26 0583 - Wiring Connections.

1.3. REFERENCE STANDARDS

   A. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SYSTEM DESCRIPTION

   A. Built-in firebox with concealed flue; rectangular shape; gas starter and circulating fan.

1.5. SUBMITTALS

   A. See Section 01 3300 - Submittals for submittal procedures.
   B. Product Data: Provide fire box cabinet dimensions, clearances required from adjacent dissimilar construction, applicable regulatory agency approvals, electrical characteristics of fan.
   C. Shop Drawings: Indicate fire box rough opening dimensions, rough opening sizes for chimney flue, and fan size.
   D. Manufacturer's Certificate: Certify that fireplace components meet or exceed UL (DIR) requirements.
   E. Manufacturer's Instructions: Indicate installation procedures and component installation sequence, clearances and tolerances from adjacent construction.

1.6. REGULATORY REQUIREMENTS

   A. Conform to applicable code for clearances from adjacent materials, chimney height above roof line requirements, and unit UL approval.
   B. Listed by Underwriters Laboratories Inc. (UL) as complying with UL 127.
   C. Products Requiring Electrical Connection: Listed and labeled by 1 or testing firm acceptable to authorities having jurisdiction, as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1. MANUFACTURERS

   A. Manufactured Fireplaces:
1. **Basis of Design** Heat & Glo; Model ESC-42ST: Direct Vent See-Through gas fireplace
   [www.heatnglo.com](http://www.heatnglo.com)

B. **Other Acceptable Manufacturers:**
   1. Lennox Hearth Products; [www.ihp.us.com](http://www.ihp.us.com)
   2. Vermont Castings; [www.vermontcastings.com](http://www.vermontcastings.com)
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.2. **COMPONENTS**

A. **Fire Box:** Formed insulated steel cabinet, rectangular shaped interior, configured to include chimney outlet and cleanout, refractory brick lining.
   1. **Hearth Opening:** 42 inches wide by 23 inches high by 28 inches deep.
   2. **Flue Diameter:** 8 inches.
   3. **Combustion Air Source:** Ducted air with screened grilles and ducts.
   4. **Air Jacket:** Steel enclosure surrounding fire box, air inlets and outlets, electrical fan with rheostat switch.
   5. **BTU input Rating:** 57,500.

B. **Exposed Cladding:** Prepainted steel.

C. **Fire Box Closure:** Clear, tempered glass doors in black steel frame, butt hinged, with friction catch.

D. **Flue Construction:** Insulated stainless steel sandwich construction, modular sized sections with elbows and spacing collars to permit site assembly, air and fire stop collars, elbows, elbow offsets, tees, supports, roofing storm collar, roof flashing; nominal inside diameter of 8 inches.

E. **Roof Terminations:** Round terminal cap.

2.3. **ACCESSORIES**

A. **Fronts-Doors:** Black Non-Operable Firescreen Front.

B. **Gas Log Set:** included with fireplace insert
   1. **Control:** IntelliFire Plus RC300.

C. **Roof Flashing:** Pre-finished sheet metal, configured to fit tightly to chimney riser and seal to shingle roofing system.

2.4. **FACTORY FINISHING**

A. **Exposed to View Surfaces:** Baked enamel, Black color.

PART 3  EXECUTION

3.1. **INSTALLATION**

A. Install unit assembly in accordance with manufacturer's instructions.

B. Install chimney plumb through prepared openings using fire stop spacers.
C. Secure chimney in opening framing with appropriate fasteners.

D. Carefully cut holes for fan wall switch and grilles.

E. Install roof flashings to ensure moisture is shed from chimney flue.

3.2. TOLERANCES

A. Maximum Variation of Chimney From Plumb: 1/2 inch.

END OF SECTION 10 3100
SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.3. REFERENCE STANDARDS


D. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5. FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2  PRODUCTS

2.1. MANUFACTURERS

A. Fire Extinguishers:


2. Amerex


B. Fire Extinguisher Cabinets and Accessories:

2.2. FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
2. Size: 10 pound.
3. Finish: Baked polyester powder coat, red color.
4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.3. FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
B. Cabinet Construction: Non-fire rated.
C. Cabinet Configuration: Semi-recessed type.
1. Size to accommodate accessories.
2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.
F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
G. Weld, fill, and grind components smooth.
H. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
I. Finish of Cabinet Interior: White colored enamel.

2.4. ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.
B. Cabinet Signage: Fire Extinguisher.

PART 3 EXECUTION

3.1. EXAMINATION

   A. Verify existing conditions before starting work.
   
   B. Verify rough openings for cabinet are correctly sized and located.

3.2. INSTALLATION

   A. Install in accordance with manufacturer's instructions.
   
   B. Install cabinets plumb and level in wall openings, 48 inches from finished floor to door handle to ensure ADA requirements.
   
   C. Secure rigidly in place.
   
   D. Place extinguishers in cabinets.
   
   E. Position cabinet signage above cabinet.

END OF SECTION 10 4400
SECTION 10 73 13 - AWNINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section Includes:
   1. Fixed awnings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for awnings.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, mounting heights, and attachment details.
   2. Detail fabrication and assembly of awnings, including seam layout, spacing, and orientation of awning fabric.
   3. Include diagrams for power, signal, and control wiring.
   4. Show locations for blocking, reinforcement, and supplementary structural support.
   5. Graphics: Show text message, font, character sizes, and other graphic forms; character, word, and line spacing; margin widths; position of copy; and other information related to graphic design.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Initial Selection: For each type of exposed finish.
   1. Include Samples of fabric and accessories involving color or finish selection.

E. Samples for Verification: For the following:
   1. Awning Fabric: 12-inch- (300-mm-) square section of fabric from dye lot to be used for the Work, with specified treatments applied. Mark face of fabric.
   2. Graphics: Not less than 12-inch- (300-mm-) square section showing graphics application method.
   3. Seam, Edge, and Corner Condition: Not less than 12-inch- (300-mm-) long section showing seam, edge, and corner treatment.
   4. Valance: Full-size unit, not less than 12 inches (300 mm) long.
   5. Frame Finish: Not less than 6-inch (150-mm) lengths.

F. Product Schedule: For awnings. Use same designations indicated on Drawings.
1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For awnings to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.5 WARRANTY

A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of awnings that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:
      a. Structural failures including framework.
      b. Deterioration of fabric including seam failure.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Faulty operation of operator.
   2. Awning Warranty Period: Three years from date of Substantial Completion.
   3. Fabric Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Fire-Test-Response Characteristics: Provide awning fabrics with the fire-test-response characteristics indicated, as determined by testing identical products according to test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency for Flame-Spread Index of 25 or less.
   3. Permanently attach label to each awning fabric indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.
C. Manufactures: Subject to compliance with requirements, provide products by the following:

1. Lawrence Fabric and Metal
2. Traube Canvas Products
3. Jefferson Tent and Awning Company

2.2 FABRIC

A. Fabric:

1. Fiber Content: Acrylic-coated polyester/cotton blend.
3. Shrinkage: Not greater than 0.1 percent according to ASTM D 1204.
4. Stretch Factor: Not less than 1 percent according to ASTM D 4851.
5. Applied Treatment: Mildew resistant.
6. Pattern and Color: To be selected from manufacturers full range

B. Seam Thread: 100 percent bonded polyester, UV-light, mildew, and rot resistant.

2.3 AWNING FRAME AND ACCESSORY MATERIALS

A. Steel:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: ASTM A 500/A 500M.
3. Galvanized Steel Tubing: ASTM A 787/A 787M.

B. Aluminum: Alloy and temper recommended by awning manufacturer for type of use and finish indicated and with not less than the strength and durability properties of alloy and temper required by structural loads.


C. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Corrosion-resistant or noncorrodible units; weather-resistant, compatible, nonstaining materials. Provide as required for awning assembly, mounting, and secure attachment. Number as needed to comply with performance requirements and to maintain uniform appearance; evenly spaced. Where exposed to view, provide finish and color as selected by Architect from manufacturer's full range.

2. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
3. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
4. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.

5. Adhesive-Bonded Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing according to ASTM E 1512 conducted by a qualified independent testing and inspecting agency.


7. Lacing: 100 percent polyester, braided No. 4.


E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 AWNING FABRIC FABRICATION

A. Fabrication: Reinforce wear points and hardware attachment points with nonwoven webbing. Seam fabrics as follows:
   1. Fabric Edges and Seams: Manufacturer's standard hemming and seaming methods.
   2. Fabric Attachment: Manufacturer's standard.
   3. Fabric Attachment: Flat bar in open hem anchored to frame with self-tapping screws

2.5 FIXED AWNING FABRICATION

A. Frame Fabrication: Fabricate awning frames from aluminum. Preassemble in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

B. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

C. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Fabricate slip-fit connections exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

D. Weld corners and connections continuously. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed corners and 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.
E. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure awnings in place and to properly transfer loads.

F. Aluminum Finish: Manufacturer's standard primed and top-coated decorative finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

1. Color: To be selected from manufacturers full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General: Install awnings at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.

B. Install awnings after other finishing operations, including joint sealing and painting, have been completed.

C. Slip fit frame connections accurately together to form hairline joints, and tighten to secure.

D. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

1. Field Welding: Comply with the following requirements:

   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. 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.

E. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
G. Coordinate awning installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by retractable-awning manufacturer.

3.4 CLEANING AND PROTECTION

A. Touch up factory-applied finishes to restore damaged or soiled areas.

B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 107313
SECTION 12 3100 - MANUFACTURED METAL CASEWORK

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Manufactured standard casework, with cabinet hardware.

B. Countertops.

1.2. RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 07 9200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

1.3. REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.


C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, and attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

C. Shop Drawings: Indicate casework types, sizes, locations, using large scale plans, elevations, cross sections. Include rough-in and anchors, placement dimensions and tolerances and clearances required.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.

E. Manufacturer's Installation Instructions: Indicate special installation requirements.

1.5. QUALITY REQUIREMENTS

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section during handling and installation, including finished surfaces and hardware items. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Accept casework on site. Inspect on arrival for damage.
PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Metal Casework:

1. Danver Stainless Outdoor Kitchens. 1 Grand Street, Wallingford, CT 06492; phone: 203-269-2300; danver.com
2. NewAge Products. www.newageproducts.com
4. Substitutions: See Section 01 6000 - Product Requirements.

2.2. Fabrication

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.

1. Style: Flush overlay - square edge.
2. Primary Cabinet Material: Stainless steel.
3. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with the following front-to-back dimensions:
   a. Base Cabinets: 24 inches.
4. Steel Sheet Metal:
   a. Gables, Front and Back Panels, Gusset Plates, Aprons, and Rails: 18 gage, 0.0478 inch minimum thickness.
   b. Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gage, 0.0359 inch minimum thickness.
   c. Backing Sheet to Door and Door Fronts: 22 gage, 0.0299 inch minimum thickness.
5. Structural Performance: Provide components that safely support the following minimum loads, without deformation or damage:
   a. Base Units: 500 pounds per linear foot across the cabinet ends.
   b. Suspended Units: 300 pounds, minimum, static load.
   c. Tables: 300 pounds on four legs.
   d. Drawers: 125 pounds.
   e. Hanging Upper Cases: 300 pounds.
   f. Shelves: 100 pounds.
6. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
7. Edges and Seams: Smooth. Form counter tops, shelves, and drain boards from continuous sheets.
8. Shelf Edges: Turned down 3/4 inch on each side and returned 3/4 inch front and back.
10. Welding: Electric spot welded; joints ground smooth and flush.

11. Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware.
   a. Fill with sound-deadening core.

12. Fittings and Fixture Locations: Cut and drill countertops, backs, and other casework components for service outlets and fixtures.

13. Access Panels: Where indicated, for maintenance of utility service fixtures and fittings and mechanical and electrical components.


15. Fixed panels at backs of open spaces between base cabinets and at ends of utility spaces not otherwise enclosed.
   a. Cutouts for power receptacles where indicated on drawings.

16. Filler Panels: Flanged on both sides, of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

17. Sloped Tops for Upper and Floor Cabinets: 20 gage, 0.0359 inch minimum, with closed ends, flanged to allow attachment to cabinet(s) below.

18. Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials, and to separate dissimilar metals.

2.3. CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes.

B. Conform to BHMA A156.9 requirements.
   1. Acceptable base materials for plated finishes include brass, bronze, and steel.

2.4. MATERIALS

A. Sheet Steel: High-strength low-alloy, cold rolled and leveled unfinished steel sheet, ASTM A1008/A1008M, Class 1 (matte) finish.

B. Stainless Steel Sheet: ASTM A666 Type 304.

C. Sealant For Use in Casework Construction: Manufacturer's recommended type.

2.5. FINISHES

A. Metal: Degrease and phosphate etch followed by primer; minimum two coats electrostatic enamel; color as selected.

B. Stainless Steel: No. 4 finish.

C. Shop finish all components.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify adequacy of support framing and anchors.
B. Verify that service connections are correctly located and of proper characteristics.

3.2. INSTALLATION

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Large Components: Ensure that large components can be moved into final position without damage to other construction.

C. Use anchoring devices to suit conditions and substrate materials encountered.

D. Set casework items plumb and square, securely anchored to building structure, with no distortion.
   1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

   2. Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
      a. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 feet and 1/2 inch in 20 feet or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
      b. Maximum variation of finished gypsum board surface from true flatness exceeds 1/8 inch in 10 feet in any direction.

E. Align cabinets to adjoining components.

F. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

G. Secure upper and floor cabinets to concealed reinforcement at gypsum board assemblies.

H. Separate dissimilar metals to prevent galvanic action.

I. Field weld joints in stainless steel work, without open seams. Grind smooth and polish to match adjacent surfaces.

J. Field touch-up blemishes to original finish.

3.3. ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, fixtures to function smoothly.

3.4. CLEANING

A. Clean casework, counters, shelves, glass, legs, hardware, fittings and fixtures.
3.5. PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

END OF SECTION 12 3100
SECTION 12 3600 - COUNTERTOPS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Sinks molded into countertops.

1.2. RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework.

1.3. REFERENCE STANDARDS


C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.


E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).


H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

H. Installation Instructions: Manufacturer's installation instructions and recommendations.

I. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5. QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7. FIELD 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.

PART 2 PRODUCTS

2.1. COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation; www.formica.com/#sle.
         4) Wilsonart; www.wilsonart.com/#sle.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
c. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
d. Finish: Matte or suede, gloss rating of 5 to 20.
e. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.

2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.

3. Back and End Splashes: Same material, same construction.

C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness: 1/2 inch, minimum.

2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

a. Manufacturers:
   1) Basis of Design: Avonite Surfaces; : www.avonitesurfaces.com/#sle. "Right Size".
   2) Dupont; : www.corian.com/#sle.
   3) Formica Corporation; : www.formica.com/#sle.

b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.

c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
d. Color and Pattern: As selected by Architect from manufacturer's Grade 7 line.

3. Other Components Thickness: 1/2 inch, minimum.

4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; eased edge.

5. Back and End Splashes: Same sheet material, eased edge top; minimum 4 inches high. Backsplashes to be integral to countertop.

2.2. MATERIALS

A. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.3. FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.

2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.1. EXAMINATION
A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

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. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
C. Seal joint between back/end splashes and vertical surfaces.

3.4. CLEANING
A. Clean countertops surfaces thoroughly.

3.5. PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 3600
SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Wet-pipe sprinkler system.
B. Dry-pipe sprinkler system.
C. System design, installation, and certification.

1.2. REFERENCE STANDARDS

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3. SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.
B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.
E. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.4. QUALITY ASSURANCE

A. Conform to FM (AG) requirements.
B. Designer Qualifications: Design system under direct supervision of a Professional Engineer, or an individual having NICET Level III, or IV certification, and experienced in design of this type of work and licensed in the State in which the Project is located.
PART 2 PRODUCTS

2.1. SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Majority light hazard.

C. Water Supply: Utilize existing water flow test data.

D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to existing cabinets, and only where additional head types are installed.

2.2. SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Upright type.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Chrome plated.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Chrome plated.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Dry Sprinklers: Recessed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Flexible Drop System: Stainless steel, multiple use, open gate type.
   1. Application: Use to properly locate sprinkler heads.
   2. Include all supports and bracing.
   3. Provide braided type tube as required for the application.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.
B. Install equipment in accordance with manufacturer's instructions.

C. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

F. Flush entire piping system of foreign matter.

G. Hydrostatically test entire system.

H. Require test be witnessed by Authority Having Jurisdiction.

END OF SECTION 21 1300
SECTION 22 0523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Applications.
B. General requirements.
C. Ball valves.
D. Check valves.
E. Globe/balancing valves.

1.2. ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. PTFE: Polytetrafluoroethylene.
E. TFE: Tetrafluoroethylene.

1.3. REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
D. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
E. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.4. SUBMITTALS

A. See Section 13300 - Submittals, ro submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

PART 2 PRODUCTS

2.1. APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:

   1. Shutoff: Ball, valves.
2. Throttling: Provide Taco AccuFlo balance valves.

B. Domestic, Hot and Cold Water Valves:
   1. 2 NPS and Smaller:
      a. Bronze: Provide with solder-joint or threaded ends.
      b. Ball: Two piece, full port, bronze with brass trim.
      c. Bronze Swing Check: Class 125, bronze disc.

2.2. GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

D. Valve-End Connections:

2.3. BRONZE BALL VALVES

A. Two Piece, Full Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig.
   3. CWP Rating: 600 psig.
   5. Ends: Threaded.
   6. Seats: PTFE or TFE.
   7. Ball: Chrome plated brass.

2.4. BRONZE SWING CHECK VALVES

A. Class 125: CWP Rating: 200 psig (1380 kPa) and Class 150: CWP Rating: 300 psig (2070 kPa).
   1. Comply with MSS SP-80, Type 3.
   2. Design: Horizontal flow.
   4. Ends: Threaded as indicated.
   5. Disc: Bronze.
PART 3 EXECUTION

3.1. EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2. INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION 22 0523
SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1  GENERAL

1.1. SECTION INCLUDES

   A. Pipe markers.

1.2. SUBMITTALS

   A. See Section 13300 - Submittals, for submittal procedures.
   
   B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2  PRODUCTS

2.1. IDENTIFICATION APPLICATIONS

   A. Piping: Pipe markers.

2.2. PIPE MARKERS

   A. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3  EXECUTION

3.1. INSTALLATION

   A. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION 22 0553
SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2. RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2  PRODUCTS

2.1. REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2. GLASS FIBER

A. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

B. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

C. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

   1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.

PART 3  EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing
      longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch
      expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent
      pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure
      with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with
      outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
      Finish with glass cloth and adhesive or PVC fitting covers.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports,
   protrusions, and interruptions. At fire separations, refer to Section 07 8400.

3.2. SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply and Recirculation:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: 1 to 2 1/2 inch.
            (a) Thickness: 1 inch.
         2) Pipe Size Range: 3/4 inch and under.
            (a) Thickness: 1/2 inch.
   2. Domestic Cold Water:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: 1 1/2 inch and larger.
            (a) Thickness: 1 inch.
         2) Pipe Size Range: 1 inch and under.
            (a) Thickness: 1/2 inch.

END OF SECTION 22 0719
SECTION 22 1005 - PLUMBING PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Natural Gas.
   4. Flanges, unions, and couplings.
   5. Pipe hangers and supports.

1.2. REFERENCE STANDARDS

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
H. ASME B31.9 - Building Services Piping; 2014.
M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
N. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.


1.3. SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.4. QUALITY ASSURANCE

A. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2. SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.

2.3. SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.

B. Copper Tube: ASTM B306, DWV.

C. PVC Pipe: ASTM D2665.
   1. Fittings: PVC.

2.4. DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PE Pipe: ASTM D2239.
   1. Fittings: ASTM D2609, PE.
   2. Joints: Mechanical with stainless steel clamp.

2.5. DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.
      a. Manufacturers:
         1) Viega Press-Fitt system (no substitutions).

2.6. NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   2. Joints: Threaded or welded to ASME B31.1.

2.7. FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8. PIPE HANGERS AND SUPPORTS
A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

2.9. STRainers
A. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

PART 3 EXECUTION
3.1. PREPARATION
A. Ream pipe and tube 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. Install in accordance with manufacturer's instructions.

B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

C. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.

D. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

E. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

F. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.3. SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inches to 1-1/4 inches:
         1) Maximum Hanger Spacing: 6.5 ft.
         2) Hanger Rod Diameter: 3/8 inches.
      b. Pipe Size: 1-1/2 inches to 2 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 3/8 inch.
      c. Pipe Size: 2-1/2 inches to 3 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 1/2 inch.
      d. Pipe Size: 4 inches to 6 inches:
         1) Maximum Hanger Spacing: 10 ft.
         2) Hanger Rod Diameter: 5/8 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft.
2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION 22 1005
SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES
   A. Drains.
   B. Cleanouts.
   C. Hydrants.
   D. Backflow preventers.
   E. Mixing valves.

1.2. REFERENCE STANDARDS

1.3. SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. See Section 013300 - Submittals, for submittal procedures.
   C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS
   A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2. DRAINS
   A. Refer to plan schedules for all drains associated with this project.

2.3. CLEANOUTS
   A. Refer to plan cleanout schedules for all cleanouts associated with this project.

2.4. HYDRANTS
   A. Refer to plan schedules for sill cocks to be used for this project.

PART 3 EXECUTION

3.1. INSTALLATION
   A. Install in accordance with manufacturer's instructions.
B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

END OF SECTION 22 1006
SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Water Heaters:
   1. Commercial electric.

B. Domestic Water Filters and Treatment equipment.

1.2. REFERENCE STANDARDS


1.3. SUBMITTALS

A. See Section 013300 - Submittals, for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Provide electrical characteristics and connection requirements.

1.4. QUALITY ASSURANCE

A. Certifications:
   2. Electric Water Heaters: UL listed and labeled to UL 174.
   3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2  PRODUCTS

2.1. WATER HEATERS

A. Refer to plan schedules for water heaters to be utilized for this project.

2.2. DOMESTIC WATER FILTERS AND TREATMENT EQUIPMENT

A. Reference plan schedules for domestic water filters and treatment equipment.

PART 3  EXECUTION

3.1. INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.
C. Install water filters allowing adequate room for filter cartridge change out.

D. Route equipment drains full size to floor drain terminating with air gap.

END OF SECTION 22 3000
SECTION 22 4000 - PLUMBING FIXTURES

PART 1  GENERAL

1.1. SECTION INCLUDES

   A. Water closets.

   B. Lavatories.

   C. Sinks.

   D. Electric water coolers.

1.2. REFERENCE STANDARDS


1.3. SUBMITTALS

   A. See Section 013300 - Submittals, for submittal procedures.

   B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

PART 2  PRODUCTS

2.1. GENERAL

   A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2. FLUSH VALVE WATER CLOSETS

   A. Refer to plan schedules for flush valve water closets to be used for this project.

2.3. TANK TYPE WATER CLOSETS

   A. Refer to plan schedules for tank type water closets to be used for this project.

2.4. LAVATORIES

   A. Refer to plan schedules for lavatories to be used for this project.

2.5. SINKS

   A. Refer to plan schedules for sinks to be used for this project.

2.6. ELECTRIC WATER COOLERS

   A. Refer to plan schedules for electric water coolers to be used for this project.
PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
   B. Verify that electric power is available and of the correct characteristics.
   C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2. PREPARATION
   A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3. INSTALLATION
   A. Install each fixture with trap, easily removable for servicing and cleaning.
   B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
   C. Install components level and plumb.
   D. Install and secure fixtures in place with wall supports and bolts.

3.4. INTERFACE WITH WORK OF OTHER SECTIONS
   A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5. ADJUSTING
   A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6. CLEANING
   A. Clean plumbing fixtures and equipment.

3.7. PROTECTION
   A. Protect installed products from damage due to subsequent construction operations.
   B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 22 4000
SECTION 23 0513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1  GENERAL

1.1.  SECTION INCLUDES

A. General construction and requirements.
B. Applications.
C. Single phase electric motors.
D. Three phase electric motors.
E. Electronically Commutated Motors (ECM).

1.2.  REFERENCE STANDARDS

B. NEMA MG 1 - Motors and Generators; 2017.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3.  SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

PART 2  PRODUCTS

2.1.  GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service:
   1. Motors 1/2 HP and Smaller:  115 volts, single phase, 60 Hz.
   2. Motors Larger than 1/2 Horsepower:  208 volts, three phase, 60 Hz.

B. Nominal Efficiency:
   1. Open Motor with Two Poles:  82.5.
   2. Open Motor with Four Poles:  82.5.
   3. Open Motor with Six Poles:  50.0.
   4. Enclosed Motor with Two Poles:  75.5.
   5. Enclosed Motor with Four Poles:  82.5.

C. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

E. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.2. APPLICATIONS
   A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
   B. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
   C. Motors located in direct drive axial fans: Totally enclosed type.

2.3. SINGLE PHASE POWER - SPLIT PHASE MOTORS
   A. Starting Torque: Less than 150 percent of full load torque.
   B. Starting Current: Up to seven times full load current.
   C. Breakdown Torque: Approximately 200 percent of full load torque.
   D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
   E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.4. SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS
   A. Starting Torque: Exceeding one fourth of full load torque.
   B. Starting Current: Up to six times full load current.
   C. Multiple Speed: Through tapped windings.
   D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5. SINGLE PHASE POWER - CAPACITOR START MOTORS
   A. Starting Torque: Three times full load torque.
   B. Starting Current: Less than five times full load current.
   C. Pull-up Torque: Up to 350 percent of full load torque.
   D. Breakdown Torque: Approximately 250 percent of full load torque.
E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.6. THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.


E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

2.7. ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Applications:
   1. Commercial:
      a. Packaged Air Handling Unit:
         1) Operating Mode: Constant speed.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the roof top unit and/or specified sequence of operation.
         3) RPM: 300 through 1200.
      
      b. Hydronic Fan Coil Unit:
         1) Operating Mode: Constant cfm.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the fan coil unit and/or specified sequence of operation.
         3) Options: Remote mount control.
         4) RPM: 300 through 1250.

      c. Power Roof Ventilator (PRV):
         1) Operating Mode: Constant cfm.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the PRV and/or specified sequence of operation.
         3) Options: Remote mount control/User-interface box.
PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 23 0513
SECTION 23 0516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1  GENERAL

1.1. SECTION INCLUDES
   A. Flexible pipe connectors.
   B. Expansion joints and compensators.
   C. Pipe loops, offsets, and swing joints.

1.2. RELATED REQUIREMENTS
   A. Section 23 2113 - Hydronic Piping.

1.3. SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data:
      1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
      2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

PART 2  PRODUCTS

2.1. FLEXIBLE PIPE CONNECTORS - STEEL PIPING
   A. Inner Hose: Bronze.
   B. Pressure Rating: 125 psi and 450 degrees F.
   C. Joint: Flanged.
   D. Size: Use pipe sized units.
   E. Maximum offset: 3/4 inch on each side of installed center line.

2.2. FLEXIBLE PIPE CONNECTORS - COPPER PIPING
   A. Inner Hose: Bronze.
   B. Exterior Sleeve: Braided bronze.
   C. Pressure Rating: 125 psi and 450 degrees F.
   D. Joint: Flanged.
   E. Size: Use pipe sized units.
   F. Maximum offset: 3/4 inch on each side of installed center line.
G. Application: Copper piping.

2.3. EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE

A. Construction: Bronze with anti-torque device, limit stops, internal guides.

B. Pressure Rating: 125 psi and 400 degrees F.


D. Maximum Extension: 1/4 inch.

E. Joint: Soldered.

F. Size: Use pipe sized units.

G. Application: Copper piping.

2.4. EXPANSION JOINTS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.

B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.

C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Allowable Working Pressure: 150 psig at 120 degrees F.
   2. Accommodate the Following:
      b. Lateral Movement: one inch.
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. End Connections: Same as specified for pipe jointing.
   4. Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

D. Anchor pipe to building structure. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
E. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION 23 0516
SECTION 23 0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Pipe sleeves.

1.2. RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 23 0523 - General-Duty Valves for HVAC Piping.

C. Section 23 0719 - HVAC Piping Insulation.

1.3. REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.


1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.5. QUALITY ASSURANCE

PART 2  PRODUCTS

2.1. PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.

2. Provide sealant for watertight joint.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Clearances:

1. Provide allowance for insulated piping.

2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material conforming to ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

PART 3  EXECUTION

3.1. PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and foreign material, from inside and outside, before assembly.

3.2. INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

E. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Aboveground Piping:
      a. Pack solid using mineral fiber conforming to ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   2. All Rated Openings: Caulk tight with fire stopping material conforming to ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
   3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.3. CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 23 0517
SECTION 23 0519 - METERS AND GAUGES FOR HVAC PIPING

PART 1  GENERAL

1.1. SECTION INCLUDES
  A. Flow meters.
  B. Pressure gauges and pressure gauge taps.
  C. Thermometers and thermometer wells.
  D. Static pressure gauges.
  E. Filter gauges.

1.2. RELATED REQUIREMENTS
  A. Section 23 0923 - Direct-Digital Control System for HVAC.
  B. Section 23 0993 - Sequence of Operations for HVAC Controls.
  C. Section 23 2113 - Hydronic Piping.

1.3. REFERENCE STANDARDS
  A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
  E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.4. SUBMITTALS
  A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
  B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2  PRODUCTS

2.1. LIQUID FLOW METERS
  A. Manufacturers:
B. Calibrated ASME MFC-3M Venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.

C. Annular element flow stations with meter set.
   1. Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
      a. Pressure rating: 275 psi.
      b. Maximum temperature: 400 degrees F.
      c. Accuracy: Plus 0.55 percent to minus 2.30 percent.
   2. Portable Meter Set: Dry single diaphragm type pressure gauge with 6 inch dial pointer, stainless steel wetted metal parts, variable pulsation damper, equalizing valve, two bleed valves, and master chart for direct conversion of meter readings to flow rate, mounted in rust-proof carrying case with two ten foot long rubber test hoses with brass valves or quick connections for measuring stations.

2.2. PRESSURE GAUGES

A. Manufacturers:

B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi and KPa.

2.3. PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.
B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.4. STEM TYPE THERMOMETERS

A. Manufacturers:
B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Stem: 0.25 inch brass.
   4. Accuracy: 2 percent, per ASTM E77.
   5. Calibration: Degrees F.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   4. Accuracy: 2 percent, per ASTM E77.
   5. Calibration: Degrees F.

2.5. DIAL THERMOMETERS

A. Manufacturers:

B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 5 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

C. Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
   1. Size: 3 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

D. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.
1. Size: 4-1/2 inch diameter dial.
2. Lens: Clear glass.
3. Length of Capillary: Minimum 5 feet.
4. Accuracy: 2 percent.
5. Calibration: Degrees F.

2.6. THERMOMETER SUPPORTS
   A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
   B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.7. TEST PLUGS
   A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.
   B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.8. STATIC PRESSURE GAUGES
   A. Manufacturers:
   B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
   C. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.
   D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.1. INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
   C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Provide siphon on gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.
   D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
E. Install thermometers in air duct systems on flanges.

F. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

G. Coil and conceal excess capillary on remote element instruments.

H. Provide instruments with scale ranges selected according to service with largest appropriate scale.

I. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

J. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

K. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION 23 0519
SECTION 23 0523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Applications.
B. General requirements.
C. Globe valves.
D. Ball valves.
E. Check valves.

1.2. ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Nonrising stem.
E. OS&Y: Outside screw and yoke.
F. PTFE: Polytetrafluoroethylene.
G. RS: Rising stem.
H. SWP: Steam working pressure.
I. TFE: Tetrafluoroethylene.

1.3. REFERENCE STANDARDS

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
E. AWWA C606 - Grooved and Shouldered Joints; 2015.
F. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
G. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
H. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
1.4. **SUBMITTALS**
   
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

   B. **Product Data:** Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.5. **QUALITY ASSURANCE**

   A. Manufacturer:
      
      1. Obtain valves for each valve type from single manufacturer.
      
      2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

   B. Welding Materials and Procedures: Conform to ASME BPVC-IX.

**PART 2 PRODUCTS**

2.1. **APPLICATIONS**

   A. Provide the following valves for the applications if not indicated on drawings:

      1. Throttling (Hydronic): Butterfly, Ball, and Globe.
      
      2. Isolation (Shutoff): Butterfly, Gate, Ball, Plug,.
      
      3. Dead-End: Butterfly, single-flange (lug) type.

   B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

   C. **Required Valve End Connections for Non-Wafer Types:**

      1. Copper Tube:

         a. 2 NPS and Smaller: Solder-joint valve-ends or brazed.

   D. Chilled Water Valves:

      1. 2 NPS and Smaller, Bronze Valves:

         a. Solder-joint ends.
         
         b. Ball: Full port, one piece, bronze trim.
         
         c. Swing Check: Bronze disc, Class.
         
         d. Gate: NRS, Class 125.
         
         e. Globe: Bronze disc, Class 125.

   E. Heating Hot Water Valves:

      1. 2 NPS and Smaller, Bronze Valves:

         a. Flanged ends.
         
         b. Ball: Full port, one piece, bronze trim.
         
         c. Swing Check: Bronze disc, Class 125.
2.2. GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Gear Actuator: Quarter-turn valves 8 NPS and larger.

D. Valves in Insulated Piping: Provide 2 NPS stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   4. Memory Stops: Fully adjustable after insulation is installed.

E. Memory Stops: Fully adjustable after insulation is installed.

F. Valve-End Connections:
   1. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.

G. Bronze Valves:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.3. BRONZE GLOBE VALVES

A. Class 125: CWP Rating: 200 psig:
   1. Comply with MSS SP-80, Type 1.
   3. Ends: Solder joint.
   4. Stem and Disc: Bronze or PTFE.
   5. Packing: Asbestos free.
      a. Handwheel: Malleable iron.

2.4. BRONZE BALL VALVES

A. One Piece, Reduced Port with Bronze Trim:
1. Comply with MSS SP-110.
2. CWP Rating: 400 psig.
5. Seats: PTFE.
7. Ball: Chrome plated brass.

2.5. BRONZE SWING CHECK VALVES

A. Class 125: CWP Rating: 200 psig (1380 kPa) and Class 150: CWP Rating: 300 psig (2070 kPa).
   1. Comply with MSS SP-80, Type 3.
   2. Body Design: Horizontal flow.
   4. Ends: Solder-joint or brazed.
   5. Disc: Bronze.

2.6. BRONZE GATE VALVES

A. Non-Rising Stem (NRS) or Rising Stem (RS):
   1. Comply with MSS SP-80, Type I.
   5. Ends: Brazed.
   7. Disc: Solid wedge; bronze.
   9. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.1. INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION 23 0523
SECTION 23 0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.2. REFERENCE STANDARDS


F. MFMA-4 - Metal Framing Standards Publication; 2004.


1.3. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
PART 2  PRODUCTS

2.1. SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Manufacturers:

2. Comply with MFMA-4.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2 inch diameter.
   b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
   c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
   d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Thermal Insulated Pipe Supports:

1. General Construction and Requirements:
   a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
   b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
   c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
   d. Insulation inserts to consist of polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.

2. PVC Jacket:
a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
b. Minimum Service Temperature: Minus 40 degrees F.
c. Maximum Service Temperature: 180 degrees F.
d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
e. Thickness: 60 mil.
f. Connections: Brush on welding adhesive.

3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

E. Anchors and Fasteners:

1. Manufacturers - Mechanical Anchors and Powder-Actuated Fastening Systems:

2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.


7. Steel: Use beam clamps, machine bolts, or welded threaded studs.


10. Plastic and lead anchors are not permitted.

11. Powder-actuated fasteners are permitted only as follows:
   a. Where approved by Architect.
   b. Use only threaded studs; do not use pins.

12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   b. Channel Material: Use galvanized steel.
   c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
PART 3  EXECUTION

3.1.  INSTALLATION

A.  Install products in accordance with manufacturer's instructions.

B.  Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C.  Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D.  Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E.  Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F.  Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G.  Equipment Support and Attachment:

1.  Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2.  Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3.  Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4.  Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H.  Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

I.  Secure fasteners according to manufacturer's recommended torque settings.

J.  Remove temporary supports.

END OF SECTION 23 0529
SECTION 23 0548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Equipment support bases.
B. Vibration isolators.
C. Seismic snubber assemblies.
D. Seismic restraints for suspended components and equipment.
E. Roof curbs.

1.2. REFERENCE STANDARDS

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

1.3. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:
   1. Provide schedule of vibration isolator type with location and load on each.
   2. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.
   3. Include auxiliary motor slide bases and rails, base weights, inertia bases, concrete weights, equipment static loads, support points, vibration isolators, and detailed layout of isolator location and orientation with static and dynamic load on each isolator.
   4. Include the seal of the Professional Structural Engineer registered in the State of Missouri in which the Project is located, on drawings and calculations which at a minimum include the following:
      a. Seismic Restraint Details: Detailed drawings of seismic restraints and snubbers including anchorage details that indicate quantity, diameter, and depth of penetration, edge distance, and spacing of anchors.
b. Equipment Seismic Qualification Certification: Certification by the manufacturer or responsible party that each piece of equipment provided will withstand seismic force levels as specified in the applicable building code for seismic controls.

C. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 PRODUCTS

2.1. MANUFACTURERS


2.2. PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
   2. Steel springs to function without undue stress or overloading.

2.3. EQUIPMENT SUPPORT BASES

A. Structural Bases:
   1. Construction: Engineered, structural steel frames with welded brackets for side mounting of the isolators.
   2. Frames: Square, rectangular or T-shaped.
   3. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

2.4. VIBRATION ISOLATORS

A. Non-Seismic Type:
   1. All Elastomeric-Fiber Glass Pads:
      a. Configuration: Flat or molded.
      b. Thickness: 0.25 inch minimum.
      c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
   2. Elastomeric Mounts:
      a. Material: Oil, ozone, and oxidant resistant compounds.
      b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
   3. Steel Springs:
      a. Assembly: Freestanding, laterally stable without housing.
b. Leveling Device: Rigidly connected to equipment or frame.

4. Restrained Steel Springs:
   a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
   b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.

5. Elastomeric Hangers:
   a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
   b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.

6. Spring Hanger:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

7. Combination Elastomeric-Spring Hanger:
   a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

B. Seismic Type:

1. Coil Springs Consisting of Single Elements:
   a. Housing: Manufactured from cast iron material.
   b. Ductile Material: Designed and rated for seismic applications.
   c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
   d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
   e. Resilient Pad: Located in series with spring.
   f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
   g. Finish: Suitable for the application.

2. All Directional Elastomeric:
   a. Material: Molded from oil, ozone, and oxidant resistant compounds.
   b. Operating Parameters: Designed to operate within the isolator strain limits providing maximum performance and service life.
   c. Attachment Method: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
   d. Rating: Cast iron and aluminum housings rated for seismic restraint applications.
2.5. SEISMIC SNUBBER ASSEMBLIES

A. Comply with:
   2. FEMA 412.
   3. FEMA 413.
   4. FEMA 414.
   5. FEMA E-74.
   6. SMACNA (SRM).

B. Lateral External:
   1. Application: Minimum three (3) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.
   2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
   3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
   4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

C. Omni Directional External:
   1. Application: Minimum four (4) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions.
   2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
   3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
   4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

D. Horizontal Single Axis External:
   1. Application: Minimum four (4) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.
   2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
   3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
   4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.
2.6. SEISMIC RESTRAINTS FOR SUSPENDED COMPONENTS AND EQUIPMENT

A. Comply with:
   2. FEMA 412.
   3. FEMA 413.
   4. FEMA 414.
   5. FEMA E-74.
   6. SMACNA (SRM).

B. Cable Restraints:
   1. Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.
   3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
   4. Connections:
      a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
      b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
   5. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

C. Rigid Restraints:
   1. Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
   2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
   3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
   4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
   5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

2.7. ROOF CURBS

A. Vibration Isolation Curbs:
   1. Seismic Curb:
      a. Location: Between structure and rooftop equipment.
      b. Construction: Steel.
      c. Integral vibration isolation to conform to requirements of this section.
      d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
e. Weather exposed components consist of corrosion resistant materials.

PART 3 EXECUTION

3.1. INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Bases:
   1. Set steel bases for one inch clearance between housekeeping pad and base.
   2. Adjust equipment level.

C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

D. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance.
   1. Up to 4 Inches Pipe Size: First three points of support.
   2. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.2. INSTALLATION - SEISMIC

A. Seismic Snubbers:
   1. Provide on all isolated equipment, piping and ductwork.
   2. Provide minimum of four seismic snubbers located close to isolators.
   3. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance.
   4. Snub all other equipment between 0.15 inch and 0.25 inch clearance.

B. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
   1. Install equipment anchorage items designed to resist seismic design force in any direction.
   2. Install vibration and seismic controls designed to include base and isolator requirements.
   3. Provide flexible connections between equipment and interconnected piping.
   4. Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.
   5. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.
   6. Where concrete floor thickness is less than required for expansion anchor installation, install through bolt in lieu of expansion anchor.
   7. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, install supplemental framing or blocking to transfer loads to structural elements.

C. Suspended Mechanical Equipment:
   1. Provide supports and bracing to resist seismic design force in any direction.
2. Provide flexible connections between equipment and interconnected piping.
3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
4. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

D. Wall mounted Mechanical Equipment:
1. Provide support and bracing to resist seismic design force in any direction.
2. Install backing plates or blocking as required to deliver load to primary wall framing members.

E. Piping:
1. Provide seismic bracing in accordance ASCE 7.
2. Provide supports, braces, and anchors to resist gravity and seismic design forces.
3. Provide flexible connections between floor mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.
4. Brace resiliently supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to the structure.
5. Brace every run 5.0 feet or more in length with two transverse and one longitudinal bracing locations.
6. Piping Explicitly Exempt from Seismic Bracing Requirements:
   a. Provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.
   b. Install piping consistent with ASCE 7, such that swinging of the pipes will not cause damaging impact with adjacent components, finishes, or structural framing while maintaining clear horizontal distance of 67 percent of the hanger length between subject components.
   c. Provide swing restraints as required to control potential impact due to limited space between subject components.

F. Ductwork:
1. Provide seismic bracing for ducts with cross sectional area greater than 6 sq ft (independent of duct contents).
2. Provide seismic bracing for all ducts containing hazardous materials.
3. Provide supports, braces, and anchors to resist gravity and seismic design forces.
4. Install ducts and duct risers designed to accommodate interstory drift.
5. Independently support in-line devices weighing more than 20 pounds.
6. Independently support and brace all in-line devices weighing more than 75 pounds.
7. Provide unbraced piping attached to braced in-line equipment with adequate flexibility to accommodate differential displacements.
8. Positively attach dampers, louvers, diffusers and similar appurtenances to ductwork with mechanical fasteners.
9. Install duct supports designed to resist not less than 150 percent of the duct weight.

10. The use of power driven fasteners is prohibited in the hanging of ducts weighing over 10 pounds per lineal foot for seismic design categories D, E, and F.

END OF SECTION 23 0548
SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1  GENERAL

1.1. SECTION INCLUDES
A. Nameplates.
B. Tags.
C. Adhesive-backed duct markers.
D. Stencils.
E. Pipe markers.
F. Ceiling tacks.

1.2. RELATED REQUIREMENTS
A. Section 09 9123 - Interior Painting: Identification painting.

1.3. REFERENCE STANDARDS

1.4. SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2  PRODUCTS

2.1. IDENTIFICATION APPLICATIONS
A. Air Handling Units: Nameplates.
B. Automatic Controls: Tags. Key to control schematic.
C. Control Panels: Nameplates.
D. Dampers: Ceiling tacks, where located above lay-in ceiling.
E. Ductwork: Stencilled painting.
F. Major Control Components: Nameplates.
G. Piping: Pipe markers.
H. Small-sized Equipment: Tags.
I. Thermostats: Nameplates.

J. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2. NAMEPLATES

A. Manufacturers:


C. Letter Height: 1/4 inch.

D. Background Color: Black.

E. Plastic: Conform to ASTM D709.

2.3. TAGS

A. Manufacturers:

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4. ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

B. Style: Individual Label.

C. Color: Yellow/Black.

2.5. STENCILS

A. Stencils: With clean cut symbols and letters of following size:

   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 9123, semi-gloss enamel, colors conforming to ASME A13.1.

2.6. PIPE MARKERS


B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Color code as follows:
   1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

2.7. CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.

PART 3 EXECUTION

3.1. PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2. INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 9123.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.
2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 0553
SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

1.2. REFERENCE STANDARDS


1.3. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION

3.1. GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   3. SMACNA (TAB).
   4. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

E. TAB Supervisor Qualifications: Professional Engineer licensed in the State in which the Project is located.

3.2. EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Access doors are closed and duct end caps are in place.
   9. Air outlets are installed and connected.
  10. Duct system leakage is minimized.
  11. Hydronic systems are flushed, filled, and vented.
  12. Pumps are rotating correctly.
  13. Proper strainer baskets are clean and in place.
  14. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

3.3. ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4. RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5. AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.6. WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.7. SCOPE

A. Test, adjust, and balance the following:
   1. Packaged Roof Top Heating/Cooling Units.
   2. Packaged Terminal Air Conditioning Units.
   3. Unit Air Conditioners.
   4. Air Coils.
   5. Induction Units.
   6. Air Handling Units.
   7. Fans.
   8. Air Filters.
   9. Air Terminal Units.
  10. Air Inlets and Outlets.

3.8. MINIMUM DATA TO BE REPORTED

A. Cooling Coils:
   1. Identification/number.
   2. Location.
   4. Manufacturer.
   5. Air flow, design and actual.
   6. Entering air DB temperature, design and actual.
   7. Entering air WB temperature, design and actual.
   8. Leaving air DB temperature, design and actual.
   9. Leaving air WB temperature, design and actual.
  10. Water flow, design and actual.
  11. Water pressure drop, design and actual.
  12. Entering water temperature, design and actual.
  13. Leaving water temperature, design and actual.
  14. Saturated suction temperature, design and actual.
  15. Air pressure drop, design and actual.
B. Heating Coils:
   1. Identification/number.
   2. Location.
   4. Manufacturer.
   5. Air flow, design and actual.
   6. Water flow, design and actual.
   7. Water pressure drop, design and actual.
   8. Entering water temperature, design and actual.
   9. Leaving water temperature, design and actual.
  10. Entering air temperature, design and actual.
  11. Leaving air temperature, design and actual.
  12. Air pressure drop, design and actual.

C. Induction Units:
   1. Manufacturer.
   2. Identification/number.
   3. Location.
   4. Model number.
   5. Size.
   6. Design air flow.
   7. Design nozzle pressure drop.
   8. Final nozzle pressure drop.

D. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Arrangement/Class/Discharge.
   6. Air flow, specified and actual.
   7. Return air flow, specified and actual.
   8. Outside air flow, specified and actual.
   9. Total static pressure (total external), specified and actual.
  10. Inlet pressure.
11. Discharge pressure.
13. Number of Belts/Make/Size.
14. Fan RPM.

E. Return Air/Outside Air:
   1. Identification/location.
   2. Design air flow.
   3. Actual air flow.
   4. Design return air flow.
   5. Actual return air flow.
   6. Design outside air flow.
   7. Actual outside air flow.
   8. Return air temperature.
  10. Required mixed air temperature.
  11. Actual mixed air temperature.
  12. Design outside/return air ratio.
  13. Actual outside/return air ratio.

F. Exhaust Fans:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Total static pressure (total external), specified and actual.
   7. Inlet pressure.
   8. Discharge pressure.
  10. Number of Belts/Make/Size.
  11. Fan RPM.

G. Duct Traverses:
   1. System zone/branch.
   2. Duct size.
   3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

H. Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

END OF SECTION 23 0593
SECTION 23 0713 - DUCT INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Duct insulation.

1.2. RELATED REQUIREMENTS

A. Section 23 0553 - Identification for HVAC Piping and Equipment.

B. Section 23 3100 - HVAC Ducts and Casings: Glass fiber ducts.

1.3. REFERENCE STANDARDS


1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.
PART 2 PRODUCTS

2.1. REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2. GLASS FIBER, FLEXIBLE

A. Manufacturer:

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1200 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

2.3. GLASS FIBER, RIGID

A. Manufacturer:

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Indoor Vapor Barrier Finish:
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.

F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.

3.2. SCHEDULES

3.3.

A. Concealed Indoor Ducts:
   1. Exhaust Ducts Within 10 ft of Exterior Openings: R-8
   2. 
   3. Exhaust Ducts Exposed to Outdoor Air: R-10

B. Outside Air Intake Ducts: R-10

C. Plenums: R-8

D. Supply Ducts: R-8

E. Return and Relief Ducts in Mechanical Rooms: R-10

F. Ducts Exposed to Outdoors: R-10

END OF SECTION 23 0713
SECTION 23 0719 - HVAC PIPING INSULATION

PART 1  GENERAL

1.1. SECTION INCLUDES
   A. Piping insulation.
   B. Jackets and accessories.
   C. Engineered wall outlet seals and refrigerant piping insulation protection.

1.2. REFERENCE STANDARDS
   B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

1.3. SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2  PRODUCTS

2.1. REGULATORY REQUIREMENTS
   A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2. GLASS FIBER
   A. Manufacturers:

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. 'K' Value: ASTM C177, 0.23 at 75 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 650 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

E. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.3. CELLULAR GLASS

A. Insulation: ASTM C552, Type II.
   1. 'K' Value: Grade 6, 0.35 at 100 degrees F.
   2. Service Temperature: Up to 800 degrees F.
   3. Water Vapor Permeability: 0.005 perm inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

2.4. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.5. JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.
   2. Covering Adhesive Mastic: Compatible with insulation.

   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. Glass fiber insulated pipes conveying fluids above ambient temperature.
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with aluminum jacket.

3.3. SCHEDULE

END OF SECTION 23 0719
SECTION 23 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Globe pattern.
   2. Butterfly pattern.
   3. Electronic operators.

C. Dampers.

D. Damper Operators:
   1. Electric operators.

E. Input/Output Sensors:
   1. Temperature sensors.
   2. Equipment operation (current) sensors.
   3. Damper position indicators.

F. Thermostats:
   1. Electric room thermostats.
   2. Room thermostat accessories.
   3. Immersion thermostats.
   4. Airstream thermostats.
   5. Electric low limit duct thermostats.
   6. Electric high limit duct thermostats.

G. Transmitters:
   1. Pressure transmitters.
   2. Air pressure transmitters.
   4. Temperature transmitters.

H. Transducers:

1.2. RELATED REQUIREMENTS

A. Section 23 0519 - Meters and Gauges for HVAC Piping: Thermometer sockets and gauge taps.

B. Section 23 0548 - Vibration and Seismic Controls for HVAC.
C. Section 23 0923 - Direct-Digital Control System for HVAC.

D. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

E. Section 23 2114 - Hydronic Specialties.

F. Section 23 3300 - Air Duct Accessories: Installation of automatic dampers.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

H. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.3. REFERENCE STANDARDS


B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.


1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Manufacturer's Instructions: Provide for all manufactured components.

E. Designer's Qualification Statement.

F. Installer's Qualification Statement.

G. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

H. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

I. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion.
PART 2 PRODUCTS

2.1. EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2. CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.3. CONTROL VALVES

A. Globe Pattern:
   1. Up to 2 inches: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.
   2. Over 2 inches: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
   3. Hydronic Systems:
      a. Rate for service pressure of 125 psig at 250 degrees F.
      b. Replaceable plugs and seats of stainless steel.
      c. Size for 3 psig maximum pressure drop at design flow rate.
      d. two-way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two-way valve operators to close valves against pump shut off head.

B. Butterfly Pattern:
   1. Iron body, bronze disc, resilient replaceable seat for service to 180 degrees F wafer or lug ends, extended neck.
   2. Hydronic Systems:
      a. Rate for service pressure of 125 psig at 250 degrees F.
      b. Size for 1 psig maximum pressure drop at design flow rate.

C. Electronic Operators:
   1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
   2. Select operator for full shut off at maximum pump differential pressure.

2.4. DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
2. Provide one operator for maximum 36 sq ft damper section.

B. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.5. INPUT/OUTPUT SENSORS

A. Temperature Sensors:
1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
4. Temperature Sensing Device: Compatible with project DDC controllers.
5. Performance Characteristics:
   a. RTD:
      1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
      2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
      3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
      4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
      5) Range: Minus 40 degrees F through 220 degrees F minimum.
   b. Thermistor:
      1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
      2) Range: Minus 25 degrees F through 122 degrees F minimum.
      3) Heat Dissipation Constant: 2.7 mW per degree C.
   c. Temperature Transmitter:
      1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
      2) Output: 4 to 20 mA.
   d. Sensing Range:
      1) Provide limited range sensors if required to sense the range expected for a respective point.
      2) Use RTD type sensors for extended ranges beyond minus 30 degrees F to 230 degrees F.
      3) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
   e. Wire Resistance:
      1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.
2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.

f. Room Sensors: Locking cover brushed stainless steel.

g. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.

h. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.

i. Ceiling and Recessed Mount Temperature Sensors: Ceiling-mounted sensor in a low-profile housing.


k. Room Temperature Sensors (type "T" on construction document):
   1) Construct for wall box mounting.
   2) Provide the following:
      (a) Setpoint reset slide switch with an adjustable temperature range.
      (b) Individual heating/cooling setpoint slide switches.
      (c) Momentary override request push button for activation of after-hours operation.
      (d) Analog or digital thermometer.

l. Room Temperature Sensors with Integral Digital Display (type "T" on construction document):
   1) Construct for surface or wall box.
   2) Provide a four button keypad with the following capabilities:
      (a) Indication of space temperatures.
      (b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
      (c) Display and control fan operation status.
      (d) Manual occupancy override and indication of occupancy status.
      (e) Controller mode status.

B. Equipment Operation (Current) Sensors:
   1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
   2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.

C. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.

2.6. THERMOSTATS

A. Room Thermostat Accessories:
1. Thermostat Covers: Brushed aluminum.
2. Insulating Bases: For thermostats located on exterior walls.
3. Thermostat Guards: Metal mounted on separate base.
4. Adjusting Key: As required for device.
5. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

B. Immersion Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

C. Airstream Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
   2. Averaging service remote bulb element: 7.5 feet.

D. Electric Low Limit Duct Thermostats:
   1. Snap acting, single pole, single throw, manual or automatic reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

E. Electric High Limit Duct Thermostats:
   1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

2.7. TRANSMITTERS

A. Temperature Transmitters:
   1. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1/2 percent of range for 200 degrees F span and plus or minus 1 percent for 50 degrees F span, with 50 degrees F. temperature range, compensated bulb, averaging capillary, or rod and tube operation on 20 psig input pressure and 3 to 15 psig output.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that systems are ready to receive work.
C. Beginning of installation means installer accepts existing conditions.
D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats and exposed control sensors with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches. Refer to Section 26 2726.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide thermostats in aspirating boxes in front entrances.

G. Provide guards on thermostats in entrances.

H. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

I. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

J. Provide isolation (two position) dampers of parallel blade construction.

K. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

L. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

M. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

N. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3. MAINTENANCE

A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

B. Provide complete service of controls systems, including call backs, and submit written report of each service call.
C. In addition to normal service calls, make minimum of two complete normal inspections of approximately eight hours duration to inspect, calibrate, and adjust controls.

END OF SECTION 23 0913
SECTION 23 0923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1  GENERAL

1.1. SECTION INCLUDES

A. System description.
B. Operator interface.
C. Controllers.
D. Power supplies and line filtering.
E. System software.
F. Controller software.
G. HVAC control programs.

1.2. RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.
B. Section 23 0993 - Sequence of Operations for HVAC Controls.
C. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3. REFERENCE STANDARDS

C. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2014g.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
E. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data for each system component and software module.
C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. List connected data points, including connected control unit and input device.
   3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

5. Indicate description and sequence of operation of operating, user, and application software.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

E. Designer's Qualification Statement.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. Include submittals data in final "Record Documents" form.

I. Operation and Maintenance Data:
   1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

J. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

K. Maintenance Materials:
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a one year period after Substantial Completion.

C. Provide five year manufacturer's warranty for field programmable micro-processor based units.
1.7. PROTECTION OF SOFTWARE RIGHTS

A. Prior to delivery of software, the Owner and the party providing the software will enter into a software
license agreement with provisions for the following:

1. Limiting use of software to equipment provided under these specifications.
2. Limiting copying.
3. Preserving confidentiality.
4. Prohibiting transfer to a third party.

PART 2 PRODUCTS

2.1. OWNER-FURNISHED PRODUCTS

A. Existing Products:  .

1. Project is a renovation and addition project to an existing facility and control system.
2. Contractor shall field verify the existing control system including the operator workstation,
software and hardware and provide new system that is compatible with the existing system, using
the same existing operator work stations.

2.2. MANUFACTURERS

B. Johnson Controls, Inc;  :  www.johnsoncontrols.com/#sle.
C. Siemens AG, Building Technologies Division;  :  www.siemens.com/#sle.
D. Trane Company..

2.3. SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-
processor based units.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-
tasking, multi-user environment on token passing network, with central and remote hardware, software,
and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area
networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like
when directly connected to the control units. Individual terminal unit control is specified in Section 23
0913.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating
devices, interface equipment and other apparatus and accessories required to operate mechanical systems,
and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and
fully operational system.
2.4. OPERATOR INTERFACE

A. PC Based Work Station:
   1. Resides on high speed network with building controllers.
   2. Connected to server for full access to all system information.
   3. New systems in this contract to be added to the existing control system as an expansion of the existing system.

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

D. Hardware:
   1. Desktop:
      a. Computer(s) and display(s) to be provided by DDC controls manufacturer.
      b. Quantity: As indicated on the Drawings.
      c. Minimum RAM: as needed for the system.
      d. Minimum Processing Speed: as needed for the system.
      e. Minimum Hard Drive Memory: as needed for the system.
      f. Drives: as needed for the system.
      g. Ports: as needed for the system.
      h. Monitor: as needed for the system.
      i. Location(s): As directed by the Owner.
      j. Network Connection:
         1) Ethernet interface card.
         2) Minimum Speed: as needed for the system.

2.5. CONTROLLERS

A. BUILDING CONTROLLERS
   1. General:
      a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
      b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
      c. Share data between networked controllers.
      d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
      e. Utilize real-time clock for scheduling.
      f. Continuously check processor status and memory circuits for abnormal operation.
g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.

h. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
   b. Perform routing when connected to a network of custom application and application specific controllers.
   c. Provide service communication port for connection to a portable operator's terminal or handheld device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. CUSTOM APPLICATION CONTROLLERS

1. General:
   a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
   b. Share data between networked, microprocessor based controllers.
   c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
   d. Utilize real-time clock for scheduling.
   e. Continuously check processor status and memory circuits for abnormal operation.
f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
g. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or handheld device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:
   a. Diagnostic LED's for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

C. APPLICATION SPECIFIC CONTROLLERS

1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or handheld device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
1) Mount within waterproof enclosures.
2) Rated for operation at 40 to 150 degrees F.

b. Conditioned Space:
1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

D. INPUT/OUTPUT INTERFACE

1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.

2. All Input/Output Points:
   a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
   b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.

3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.

4. Pulse Accumulation Input Objects: Conform to all requirements of binary input objects and accept up to 10 pulses per second.

5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.

6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.
c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.

7. Analog Outputs:
   a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
   b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
   c. Drift to not exceed 0.4 percent of range per year.

8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

9. System Object Capacity:
   a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.6. POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
   1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
   2. Limit connected loads to 80 percent of rated capacity.
   3. Match DC power supply to current output and voltage requirements.
   4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
   5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
   6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
   7. Operational Ambient Conditions: 32 to 120 degrees F.
   8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and vibration.
   9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
   1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
   2. Minimum surge protection attributes:
a. Dielectric strength of 1000 volts minimum.

b. Response time of 10 nanoseconds or less.

c. Transverse mode noise attenuation of 65 dB or greater.

d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.7. LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).

B. LAN Capacity: Not less than 60 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 19.2 Kb.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable.

G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.8. SYSTEM SOFTWARE

A. Operating System:

1. Concurrent, multi-tasking capability.


   b. Acceptable Operating Systems: Operating system that is compatible with the existing system or Windows 10 system.

2. System Graphics:

   a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.

   b. Animation displayed by shifting image files based on object status.

   c. Provide method for operator with password to perform the following:

      1) Move between, change size, and change location of graphic displays.

      2) Modify on-line.

      3) Add, delete, or change dynamic objects consisting of:

         (a) Analog and binary values.

         (b) Dynamic text.

         (c) Static text.

         (d) Animation files.

3. Custom Graphics Generation Package:
a. Create, modify, and save graphic files and Visio format graphics in PCX formats.
b. HTML graphics to support web browser compatible formats.
c. Capture or convert graphics from AutoCAD.

4. Standard HVAC Graphics Library:
   a. HVAC Equipment:
      1) Air Handlers.
      2) Fan Coil Units.
      3) Baseboard Radiators.
   b. Ancillary Equipment:
      1) Fans.
      2) Coils.
      3) Valves.
      4) Piping.
      5) Dampers.
      6) Ductwork.
   c. File Format Compatible with Graphics Generation Package Program.

B. Workstation System Applications:
   1. Automatic System Database Save and Restore Functions:
      a. Current database copy of each Building Controller is automatically stored on hard disk.
      b. Automatic update occurs upon change in any system panel.
      c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
   2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
      a. Save database from any system panel.
      b. Clear a panel database.
      c. Initiate a download of a specified database to any system panel.
   3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
   4. On-line Help:
      a. Context-sensitive system assists operator in operation and editing.
      b. Available for all applications.
      c. Relevant screen data provided for particular screen display.
      d. Additional help available via hypertext.
   5. Security:
      a. Operator log-on requires user name and password to view, edit, add, or delete data.
b. System security selectable for each operator.
c. System supervisor sets passwords and security levels for all other operators.
d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
f. All system security data stored in encrypted format.

6. System Diagnostics:
   a. Operations Automatically Monitored:
      1) Workstations.
      2) Printers.
      3) Modems.
      4) Network connections.
      5) Building management panels.
      6) Controllers.
   b. Device failure is annunciated to the operator.

7. Alarm Processing:
   a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
   b. Configurable Objects:
      1) Alarm limits.
      2) Alarm limit differentials.
      3) States.
      4) Reactions for each object.

8. Alarm Messages:
   b. Recognizable Features:
      1) Source.
      2) Location.
      3) Nature.

9. Configurable Alarm Reactions by Workstation and Time of Day:
   a. Logging.
   b. Printing.
   c. Starting programs.
   d. Displaying messages.
   e. Dialing out to remote locations.
f. Paging.
g. Providing audible annunciation.
h. Displaying specific system graphics.

10. Custom Trend Logs:
   a. Definable for any data object in the system including interval, start time, and stop time.
   b. Trend Data:
      1) Sampled and stored on the building controller panel.
      2) Archivable on hard disk.
      3) Retrievable for use in reports, spreadsheets and standard database programs.
      4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive,
         and virtual cloud environment.
      5) Protected and encrypted format to prevent manipulation, or editing of historical data and
         event logs.

11. Alarm and Event Log:
   a. View all system alarms and change of states from any system location.
   b. Events listed chronologically.
   c. Operator with proper security acknowledges and clears alarms.
   d. Alarms not cleared by operator are archived to the workstation hard disk.

12. Object, Property Status and Control:
   a. Provide a method to view, edit if applicable, the status of any object and property in the
      system.
   b. Status Available by the Following Methods:
      1) Menu.
      2) Graphics.
      3) Custom Programs.

13. Reports and Logs:
   a. Reporting Package:
      1) Allows operator to select, modify, or create reports.
      2) Definable as to data content, format, interval, and date.
      3) Archivable to hard disk.
   b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
   c. Stored on hard disk and readily accessible by standard software applications, including
      spreadsheets and word processing.
   d. Set to be printed on operator command or specific time(s).

14. Reports:
   a. Standard:
1) Objects with current values.
2) Current alarms not locked out.
3) Disabled and overridden objects, points and SNVTs.
4) Objects in manual or automatic alarm lockout.
5) Objects in alarm lockout currently in alarm.
6) Logs:
   (a) Alarm History.
   (b) System messages.
   (c) System events.
   (d) Trends.

b. Custom:
   1) Daily.
   2) Weekly.
   3) Monthly.
   4) Annual.
   5) Time and date stamped.
   6) Title.
   7) Facility name.

c. Tenant Override:
   1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
   2) Annual report showing override usage on a monthly basis.

d. Electrical, Fuel, and Weather:
   1) Electrical Meter(s):
      (a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
      (b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.

C. Workstation Applications Editors:
   1. Provide editing software for each system application at PC workstation.
   2. Downloaded application is executed at controller panel.
   3. Full screen editor for each application allows operator to view and change:
      a. Configuration.
      b. Name.
      c. Control parameters.
d. Set-points.

4. Scheduling:
   a. Monthly calendar indicates schedules, holidays, and exceptions.
   b. Allows several related objects to be scheduled and copied to other objects or dates.
   c. Start and stop times adjustable from master schedule.

5. Custom Application Programming:
   a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
   b. Programming Features:
      1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
      2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
      3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
      4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
      5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
      6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
      7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
      8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values can be used in IF/THEN comparisons, calculations, programming statement logic, etc.
      9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.9. CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
   1. User access secured via user passwords and user names.
   2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
   3. User Log On/Log Off attempts are recorded.
   4. Automatic Log Off occurs following the last keystroke after a user defined delay time.
C. Object or Object Group Scheduling:
   1. Weekly Schedules Based on Separate, Daily Schedules:
      a. Include start, stop, optimal stop, and night economizer.
      b. 10 events maximum per schedule.
      c. Start/stop times adjustable for each group object.
   2. Exception Schedules:
      a. Based on any day of the year.
      b. Defined up to one year in advance.
      c. Automatically discarded and replaced with standard schedule for that day of the week upon execution.
   3. Holiday or Special Schedules:
      a. Capability to define up to 99 schedules.
      b. Repeated annually.
      c. Length of each period is operator defined.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
   1. Binary object is set to alarm based on the operator specified state.
   2. Analog object to have high/low alarm limits.
   3. All alarming is capable of being automatically and manually disabled.
   4. Alarm Reporting:
      a. Operator determines action to be taken for alarm event.
      b. Alarms to be routed to appropriate workstation.
      c. Reporting Options:
         1) Start programs.
         2) Print.
         3) Logged.
         4) Custom messaging.
         5) Graphical displays.
         6) Dial out to workstation receivers via system protocol.

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Section 23 0993.

H. PID Control Characteristics:
   1. Direct or reverse action.
2. Anti-windup.
3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.

I. Staggered Start Application:
   1. Prevents all controlled equipment from simultaneously restarting after power outage.
   2. Order of equipment startup is user selectable.

J. Anti-Short Cycling:
   1. All binary output objects protected from short-cycling.
   2. Allows minimum on-time and off-time to be selected.

K. On-Off Control with Differential:
   1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
   2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

L. Run-Time Totalization:
   1. Totalize run-times for all binary input objects.
   2. Provides operator with capability to assign high run-time alarm.

2.10. HVAC CONTROL PROGRAMS

A. General:
   1. Support Inch-pounds and SI (metric) units of measurement.
   2. Identify each HVAC Control system.

B. Optimal Run Time:
   1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
   2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
   3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
   4. Use outside air temperature to determine early shut down with ventilation override.
   5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
   6. Operator commands:
      a. Define term schedule.
      b. Add/delete fan status point.
      c. Add/delete outside air temperature point.
      d. Add/delete mass temperature point.
      e. Define heating/cooling parameters.
f. Define mass sensor heating/cooling parameters.
g. Lock/unlock program.
h. Request optimal run time control summary.
i. Request optimal run time mass temperature summary.
j. Request HVAC point summary.
k. Request HVAC saving profile summary.

7. Control Summary:
   a. HVAC Control system begin/end status.
   b. Optimal run time lock/unlock control status.
   c. Heating/cooling mode status.
   d. Optimal run time schedule.
   e. Start/Stop times.
   f. Optimal run time system normal start times.
   g. Occupancy and vacancy times.
   h. Optimal run time system heating/cooling mode parameters.

8. HVAC point summary:
   a. Control system identifier and status.
   b. Point ID and status.
   c. Outside air temperature point ID and status.
   d. Mass temperature point ID and point.
   e. Calculated optimal start and stop times.
   f. Period start.

C. Enthalpy Switchover:
   1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.
   2. Control summary:
      a. HVAC control system begin/end status.
      b. Enthalpy switchover optimal system status.

PART 3 EXECUTION

3.1. EXAMINATION

   A. Verify existing conditions before starting work.

   B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.
3.2. INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 0993.

C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3. MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

C. Provide basic operator training for 4 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 24 hours dedicated instructor time. Provide training on site.

3.4. DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

3.5. MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.

C. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

D. Provide complete service of systems, including call backs. Make minimum of 2 complete normal inspections of approximately 4 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

END OF SECTION 23 0923
SECTION 23 2113 - HYDRONIC PIPING

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Hydronic system requirements.
B. Heating water piping, above grade.
C. Chilled water piping, above grade.
D. Equipment drains and overflows.
E. Pipe hangers and supports.
F. Unions, flanges, mechanical couplings, and dielectric connections.
G. Flow controls.

1.2. RELATED REQUIREMENTS

A. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
B. Section 23 0523 - General-Duty Valves for HVAC Piping.
C. Section 23 0548 - Vibration and Seismic Controls for HVAC.
D. Section 23 0553 - Identification for HVAC Piping and Equipment.
E. Section 23 0719 - HVAC Piping Insulation.
F. Section 23 2114 - Hydronic Specialties.

1.3. REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.
B. ASME B16.15 - Cast Copper Alloy Threaded Fittings Classes 125 and 250; 2013.
C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
F. ASME B31.9 - Building Services Piping; 2014.
I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.


P. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

Q. AWWA C606 - Grooved and Shouldered Joints; 2015.


1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Indicate valve data and ratings.
   3. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1. HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Grooved mechanical joints may be used in accessible locations only.
      a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
b. Grooved mechanical connections and joints comply with AWWA C606.

c. Use rigid joints unless otherwise indicated.

4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.

2. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.

3. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.

4. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.

5. In heating water, chilled water, or condenser water systems, butterfly valves may be used interchangeably with gate and globe valves.

6. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

2.2. HEATING WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn, using one of the following joint types:

   a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.3. CHILLED WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:

   a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.

3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.4. EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

2.5. PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.6. UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:
   1. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:
   1. Copper Piping: Bronze.
   2. Gaskets: 1/16 inch thick preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Mechanical Couplings: Comply with ASTM F1476.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections:
   1. Waterways:
      a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
      b. Dry insulation barrier able to withstand 600 volt breakdown test.
      c. Construct of galvanized steel with threaded end connections to match connecting piping.
      d. Suitable for the required operating pressures and temperatures.
   2. Flanges:
      a. Dielectric flanges with same pressure ratings as standard flanges.
      b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
c. Dry insulation barrier able to withstand 600 volt breakdown test.
d. Construct of galvanized steel with threaded end connections to match connecting piping.
e. Suitable for the required operating pressures and temperatures.

2.7. PRESSURE INDEPENDENT TEMPERATURE CONTROL VALVES AND BALANCING VALVES

A. Control Valves: Factory-fabricated pressure independent with internal differential pressure regulator (DPRV) which automatically adjusts to normal changes in system pressure and provides 100 percent control valve authority at all positions of the valve.
   1. Maintain proportional and linear flow coil characteristics.
   2. PICV to accurately control the flow from 0 to 100 percent full rated flow with an operating pressure differential range of 3 to 60 psig.
   3. Provide ANSI/FCI 70-2 Class 4 shut-off on all sizes and field serviceable.
   4. Provide control valve to incorporate control, balancing and flow limiting. Hydronic system pressure independent control valve bodies to comply with ASME B16.34 or ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150 percent of the system design operating pressure and have the following characteristics:
      a. 2 NPS and Smaller: Class 150 bronze or brass body with union connections, stainless steel trim trim, stainless steel rising stem, stainless steel disc or ball, and screwed ends with backseating capacity repackable under pressure.

B. Electronic Actuators: Direct-mounted, self-calibrating type designed for minimum 60,000 full-stroke cycles at rated force.

C. Provide actuator with visible position indication. Fail positions on power failure to include in-place, open or closed as indicated in the controls specifications.

2.8. FLOW CONTROLS

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange to drain at low points.

3.2. SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.

2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.

3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION 23 2113
SECTION 23 2114 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Air vents.
B. Strainers.
C. Pressure-temperature test plugs.
D. Balancing valves.
E. Combination flow controls.

1.2. RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.

1.3. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

PART 2 PRODUCTS

2.1. AIR VENTS

A. Manufacturers:
B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
C. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
D. Washer Type:
   1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.2. STRAINERS

A. Manufacturers:

B. Size 2 inch and Under:
   1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.3 PRESSURE-TEMPERATURE TEST PLUGS

A. Manufacturers:

B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

C. Application: Use extended length plugs to clear insulated piping.

2.4 BALANCING VALVES

A. Size 2 inch and Smaller:
   1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
   2. Metal construction materials consist of bronze.

2.5 COMBINATION FLOW CONTROLS

A. Manufacturers:

B. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.
B. Provide manual air vents at system high points and as indicated.

C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

END OF SECTION 23 2114
SECTION 23 3100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1. SECTION INCLUDES
   A. Metal ductwork.

1.2. RELATED REQUIREMENTS
   A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
   B. Section 23 0713 - Duct Insulation: External insulation and duct liner.
   C. Section 23 3300 - Air Duct Accessories.
   D. Section 23 3700 - Air Outlets and Inlets.

1.3. REFERENCE STANDARDS
   C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
   F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.4. SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide data for duct materials.

1.5. QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

PART 2 PRODUCTS

2.1. DUCT ASSEMBLIES
   A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
   B. Ducts: Galvanized steel, unless otherwise indicated.
   C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.
   D. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. pressure class, galvanized steel.
E. Medium and High Pressure Supply: 1/2 inch w.g. pressure class, galvanized steel.
F. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel.
G. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
H. Dishwasher Exhaust: 1/2 inch w.g. pressure class, stainless steel.
   1. Construct of 18 gage, 0.0500 inch stainless steel using continuous external welded joints in rectangular sections.
I. Outside Air Intake: 1/2 inch w.g. pressure class, galvanized steel.

2.2. MATERIALS
A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
B. Stainless Steel for Ducts: ASTM A666, Type 304.
C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   3. For Use With Flexible Ducts: UL labeled.
D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3. DUCTWORK FABRICATION
A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).
E. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.4. MANUFACTURED DUCTWORK AND FITTINGS
A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
   1. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
   3. Temperature Range: Minus 10 degrees F to 160 degrees F.
B. Flexible Ducts: Multiple layers of aluminum laminate supported by helically wound spring steel wire.
1. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
3. Temperature Range: Minus 20 degrees F to 210 degrees F.

C. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

D. Dishwasher Exhaust: Minimum 21 gage, 0.0344 inch thick, single wall, Type 304 stainless steel.
   1. Single wall, factory built chimney liner system.
   2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
   3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.
   4. Manufacturers:
      c. DuraVent: www.duravent.com

PART 3 EXECUTION

3.1. INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Flexible Ducts: Connect to metal ducts with adhesive.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION 23 3100
SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Air turning devices/extractors.
B. Backdraft dampers - metal.
C. Duct access doors.
D. Duct test holes.
E. Fire dampers.
F. Flexible duct connections.
G. Volume control dampers.

1.2. RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 23 0548 - Vibration and Seismic Controls for HVAC.
C. Section 23 3100 - HVAC Ducts and Casings.

1.3. REFERENCE STANDARDS

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
D. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.
PART 2  PRODUCTS

2.1. AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2. BACKDRAFT DAMPERS - METAL

A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3. DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.4. DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.5. FIRE DAMPERS

A. Manufacturers:

   
   

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Horizontal Dampers: Galvanized steel, 22 gage, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Multiple Blade Dampers: 16 gage, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

E. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.6. FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

2.7. VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:
1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
1. Blade: 18 gage, 0.0478 inch, minimum.

D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Demonstrate re-setting of fire dampers to Owner's representative.

G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

J. Use splitter dampers only where indicated.

END OF SECTION 23 3300
SECTION 23 3423 - HVAC POWER VENTILATORS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Roof exhausters.
B. Ceiling exhaust fans.
C. Upblast roof exhausters.
D. Inline centrifugal fans.

1.2. REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.
G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

1.3. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.4. QUALITY ASSURANCE

PART 2  PRODUCTS

2.1. MANUFACTURERS

2.2. POWER VENTILATORS - GENERAL
   A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
   B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
   C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
   D. Fabrication: Conform to AMCA 99.
   E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.3. ROOF EXHAUSTERS
   A. Fan Unit: direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
   B. Roof Curb: 16 inch high of aluminum with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
   C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
   D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.
   E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4. UPBLAST ROOF EXHAUSTERS
   A. Direct Drive Fan:
      1. Fan Wheel:
         a. Type: Non-overloading, backward inclined centrifugal.
         b. Material: Aluminum.
      2. Statically and dynamically balanced.
      3. Motors:
         a. Open drip-proof (ODP).
         b. Heavy duty ball bearing type.
         c. Mount on vibration isolators or resilient cradle mounts, out of air stream.
         d. Fully accessible for maintenance.
      4. Housing:
         a. Construct of heavy gage aluminum including curb cap, windband, and motor compartment.
         b. Rigid internal support structure.
         c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
d. Construct drive frame assembly of heavy gage steel, mounted on vibration isolators.
e. Provide breather tube for fresh air motor cooling and wiring.

B. Shafts and Bearings:
1. Fan Shaft:
   a. Ground and polished steel with anti-corrosive coating.
   b. First critical speed at least 25 percent over maximum cataloged operating speed.
2. Bearings:
   a. Permanently sealed or pillow block type.
   b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
   c. 100 percent factory tested.

C. Drive Assembly:
1. Motor pulley adjustable for final system balancing.
2. Readily accessible for maintenance.

D. Disconnect Switches:
1. Factory mounted and wired.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
3. Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory applied gray unless otherwise indicated.
4. Positive electrical shutoff.
5. Wired from fan motor to junction box installed within motor compartment.

E. Roof Curb: 16 inch high self-flashing of aluminum with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.

F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

G. Options/Accessories:
1. Birdscreen:
   a. Provide stainless steel construction.
2. Dampers: Provide motorized type.
   a. Provide 24V open/close damper actuator, power close, and spring fail safe open, complete with end switch
3. Drain Connection:
   a. Aluminum construction.
5. Grease Trap:
a. Aluminum.
   b. Includes drain connection.
   c. Collects grease residue.

6. Hinge Kit:
   a. Aluminum hinges.
   b. Hinges and restraint cables mounted to base (sleeve).
   c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.


8. Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.

9. External motor speed controllers for field mounting.

2.5. INLINE CENTRIFUGAL FANS

   A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

   B. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1. INSTALLATION

   A. Install in accordance with manufacturer's instructions.

   B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

   C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

   D. Install backdraft dampers on inlet to roof and wall exhausters.

   E. Provide backdraft dampers on outlet from ceiling exhauster fans and as indicated.

END OF SECTION 23 3423
SECTION 23 3433 - AIR CURTAINS

PART 1 GENERAL

1.1. SECTION INCLUDES
   A. Air curtains with hot water heat.

1.2. RELATED REQUIREMENTS
   A. Section 23 2113 - Hydronic Piping: Hot water heating piping.

1.3. REFERENCE STANDARDS
   A. AMCA 220 - Laboratory Methods of Testing Air Curtains for Aerodynamic Performance Ratings; 2012.

1.4. SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's descriptive literature for products specified in this section; indicate options specified.
   C. Manufacturer's Instructions: Printed installation instructions for each product specified.
   D. Shop Drawings: Indicate installation and connection details for air curtains.

PART 2 PRODUCTS

2.1. MANUFACTURERS

2.2. AIR CURTAINS
   A. Product Description: Self-contained, electrically-operated, air curtain for mounting at head of door openings.
      1. Maximum Mounting Height: 8 feet.
   B. Housing:
      1. Material: Galvanized steel.
      2. Factory-provided mounting brackets.
   C. Blower Assembly: Heavy-duty motor; forward curved centrifugal fans, double inlet, double width.
   D. Water Coils:
1. Type: Cleanable.
2. Piping Connections: Threaded on same end.
3. Tube Material: Copper, complying with ASTM B 75 (ASTM B 75M).
   a. Tube Diameter: 0.625 inch.
4. Fins: Aluminum or Copper.
5. Fin and Tube Joint: Mechanical bond or Silver brazed.
7. Frames: Galvanized-steel channel frame.

E. Performance: Tested in accordance with AMCA 220.

F. Control: ON/OFF control; air curtain turns on when door is opened and off when door is closed. On board interface for BAS.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that required utilities are in correct location and are of correct capacities for specified products.
   B. Verify that mounting surfaces have sufficient strength to support units.
   C. Verify that space is ready for installation of units.
   D. Verify clearances required to maintain the units.

3.2. INSTALLATION
   A. Install air curtains in accordance with shop drawings and manufacturer's printed installation instructions.
   B. Maintain clearances required to maintain the units.
   C. Ensure proper connection to utilities.

END OF SECTION 23 3433
SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Diffusers.
B. Registers/grilles.
C. Louvers.
D. Gravity ventilators.

1.2. RELATED REQUIREMENTS

1.3. REFERENCE STANDARDS

A. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.4. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.5. QUALITY ASSURANCE

PART 2 PRODUCTS

2.1. MANUFACTURERS

2.2. RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, stamped, multi-core, square, adjustable pattern, stamped, multi-core, square and rectangular, multi-louvered, square and rectangular, adjustable pattern, and multi-louvered diffuser to discharge air in 360 degree, one way, two way, three way, and four way pattern with sectorizing baffles where indicated.

B. Connections: Round.

C. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Steel or aluminum with baked enamel finish.

E. Color: As selected by Architect from manufacturer's standard range.

F. Accessories: Provide radial opposed blade volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, anti-smudging device, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.3. CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Construction: Made of aluminum extrusions with factory enamel finish.

D. Color: As selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.4. CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.5. CEILING LINEAR EXHAUST AND RETURN GRILLES

A. Type: Streamlined blades with 90 degree one-way deflection, 1/8 by 3/4 inch on 1/4 inch centers.

B. Frame: 1-1/4 inch margin, extra heavy for floor mounting, with countersunk screw mounting.
C. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.6. WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.7. WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.8. LINEAR WALL REGISTERS/GRILLES

A. Type: Streamlined blades with 0 degree deflection, 1/8 by 3/4 inch on 1/4 inch centers.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral gang-operated opposed blade damper with removable key operator, operable from face.

2.9. LOUVERS

A. Type: 4 inch or 6 inch deep with blades on 45 degree slope, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.

B. Fabrication: 16 gage, 0.0598 inch thick galvanized steel welded assembly, with factory prime coat finish.
C. Color: To be selected by Architect from manufacturer's standard range.

2.10. GRAVITY VENTILATORS

A. Hood Intake and Relief Gravity Ventilator:

1. Manufacturers:

2. General:
   a. Low silhouette for intake and relief applications with natural gravity or negative pressure system(s).
   b. Performance ratings and factory testing to be in accordance with AMCA 511 and AMCA 550.
   c. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.

3. Hood and Base:
   b. Hood Construction: Precision formed, arched panels with interlocking seams.
   c. Vertical End Panels: Fully locked into hood end panels.
   d. Curb Cap: Pre-punched mounting holes for installation.

4. Birdscreen:
   a. Fabricate in accordance with ASTM B221 (ASTM B221M).
   b. Construction: 1/2 inch Galvanized mesh.
   c. Horizontally mounted across hood intake area.

5. Hood Support: Galvanized steel construction and fastened so hood can be removed completely from the base or hinged open.

6. Options/Accessories:
   a. Roof Curbs:
      1) Pitched Roofs: Welded, straight side curb with flashing flange and wood nailer.
      2) Material: Aluminum.
      3) Insulation Thickness: 1 inch.
   b. Provide extended base minimum 7 inch extension to base height making overall base 12 inches in height to prevent snow or moisture intake.
   c. Curb Seal: Rubber seal between fan and roof curb.
   d. Dampers:
      1) Type: Gravity.
      2) Factory designed to prevents outside air from entering back into building when fan is off.
3) Balanced for minimal resistance to flow.
4) Galvanized frames with pre-punched mounting holes.

e. Factory Finish: Baked enamel matching or complementing building colors.

f. Hood Insulation or Coating: Provide 1/2 inch fiberglass insulation lining or anti-condensate coating to prevent condensation and reduce sound levels.

g. Insect Screen:
   1) Fabricate in accordance with ASTM B221 (ASTM B221M).
   2) Construct of fine mesh aluminum.
   3) Fitted to top of the throat to prevent entry of insects.
   4) Coating: Thermo-setting polyester urethane.

h. Tie-Down Points: Aluminum brackets located on hood supports to secure fan in heavy wind applications.

PART 3 EXECUTION

3.1. INSTALLATION

   A. Install in accordance with manufacturer's instructions.

   B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

   C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

END OF SECTION 23 3700
SECTION 23 7313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Casing construction.
B. Economizer with Return Fan section.
C. Coil section.
D. Supply Fan Section
E. Filter and air cleaner section.
F. Damper section.
G. Airflow measurement.
H. Access section.
I. Controls.

1.2. RELATED REQUIREMENTS

A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.
B. Section 23 0548 - Vibration and Seismic Controls for HVAC.
C. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
D. Section 23 3300 - Air Duct Accessories: Flexible duct connections.

1.3. REFERENCE STANDARDS

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.
1.4. ADMINISTRATIVE REQUIREMENTS

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.
   2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
   3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
   4. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

1.6. QUALITY ASSURANCE

1.7. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1. MANUFACTURERS


2.2. CASING CONSTRUCTION

A. Full Perimeter Base Rail:
   2. Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.

B. Casing:
   1. Construct of one piece, two-inch solid, R-13 insulated, double wall panels.
   2. Provide mid-span, no through metal, internal thermal break.
   3. Construct outer panels of galvanized steel and inner panels of galvanized steel.
   4. Casing Air Pressure Performance Requirements:
      a. Able to withstand up to 8 inches w.g. positive or negative static pressure.
b. Not to exceed 0.0042 inches per inch deflection at 1.5 times design static pressure up to a maximum of plus 8 inches w.g. in positive pressure sections and minus 8 inches w.g. in negative pressure sections.

C. Access Doors:
   1. Construction, thermal and air pressure performance same as casing.
   2. Provide surface mounted handles on hinged, swing doors.

D. Outside Air and Exhaust Air Weather Hood: see Section 23 3700.

E. Unit Flooring: Construct with sufficient strength to support minimum 300 lb expected people loads and equipment loads associated with maintenance activities.

F. Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at the specified casing pressure.

G. Insulation:
   1. Provide minimum thermal thickness of 13 R throughout.
   2. Completely fill panel cavities in each direction to prevent voids and settling.
   3. Comply with NFPA 90A.

H. Drain Pan Construction:
   1. Provide cooling coil and humidifier sections with an insulated, double wall, galvanized steel drain pan complying with ASHRAE Std 62.1 for indoor air quality and sufficiently sized to collect all condensate.
   2. Slope in two planes to promote positive drainage and eliminate stagnate water conditions.
   3. Locate outlet of sufficient diameter at lowest point of pan to prevent overflow at normal operating conditions.
   4. Provide visible external drain connections constructed of drain pan material, extended sufficient distance beyond the base to accommodate field installed, condensate drain trapping.

I. Finish:
   1. Indoor Units:
      a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.
      b. Color: Manufacturer's standard color.

2.3. ECONOMIZER WITH RETURN FAN SECTION

A. Return fan: The fan assembly shall be a direct-drive plenum fan with high efficiency welded-aluminum impeller that is dynamically balanced as an assembly. Fan shall be maintenance free throughout its operating life. Fans shall be balanced to G6.3 per AMCA 204. No external vibration isolation is necessary. Access to motor and fan assembly through hinged access door. Access door shall be sized for removal of entire motor and fan assembly. Fans shall be arranged for top or back inlet.

B. Motor contains integrated PID controller and accepts 0-10VDC input for variable speed control. Signal is wired back to the UC600 controller or terminal strip.
C. Dampers: damper arrangement in the economizer section allows for exhaust air out the unit, return air through the air, and outside air intake into the unit. The dampers are ultra-low-leak, parallel blade dampers with edge and jamb seals. Dampers are tested and certified in accordance with AMCA 511 for air performance and air leakage. Leakage rate shall not exceed 3cfm/ft² at one-inch w.g. and 8 cfm/ft² at four-inch w.g. Dampers are double-skin airfoil design or equivalent. Damper blades and frames are galvanized steel. The damper has a properly sized drive for use with an optional factory-mounted actuator.

D. 2-inch pleated media filters made with 100% synthetic fibers that are continuously laminated to a supported steel-wire grid with water repellent adhesive shall be provided. Filters shall be capable of operating up to 625 fpm face velocity without loss of filter efficiency and holding capacity. The filters shall have a MERV 8 rating when tested in accordance with the ANSI/ASHRAE Standard 52.2.

E. 4 inch high efficiency filters constructed with a fine fiber media made into closely spaced pleats shall be provided. The filters shall be capable of operating up to 625 fpm face velocity without loss of filter efficiency and holding capacity. The filter media shall be sealed into a frame assembled in a rigid manner. The manufacturer shall supply a side access filter rack capable of holding 4 inch high efficiency filters.

F. The 4 inch high efficiency filters shall have a MERV 13 rating when tested in accordance with the ANSI/ASHRAE Standard 52.2.

G. An averaging temperature sensor shall be serpentinized across the module. All capillaries bends shall be radiused and fastened with capillary clips to prevent crimping and minimize wear.

H. Mixing Section Damper Actuators:
   1. Spring return actuators shall be mounted with the back air damper linked normally closed and the top air damper linked normally open.

2.4. COIL SECTION

A. Casing: Galvanized steel. Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B. Drain Pans: 24 inch downstream of coil and down spouts for cooling coil banks more than one coil high.

C. Eliminators: Three break of galvanized steel, mounted over drain pan.

D. Fabrication:
   1. Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
   2. Fins: Aluminum.
   3. Casing: Die formed channel frame of galvanized steel.

E. Water Heating Coils:
   1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
   2. Configuration: Drainable, with threaded plugs for drain and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.

F. Water Cooling Coils:
   1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
2. Configuration: Drainable, with threaded plugs for drain and vent; threaded plugs in return bends and in headers opposite each tube.

G. Hot Water Heating Coil: see schedule.

H. Water Cooling Coil: see schedule.

I. Condensate Overflow Switch
   1. A float switch conforming to UL 508 shall be factory-installed in the drain pan that will detect a high condensate water level and be used to shut off the air handler in the event that the primary drain is blocked to comply with IMC 2006. The float switch shall be located at a point higher than the primary drain line connection and below the overflow rim of the drain pan.

J. Access Section with Coil
   1. Unit(s) shall include a separate section housing a coil section and access section as one assembly. Section shall include a stainless steel drainpan and an access door of sufficient size to allow for visual inspection of the leaving face of the first coil in the airstream and entering face of the second coil in the airstream. Access door shall be of the same construction as all other doors on the unit.

K. Low Limit
   1. A single-pole single throw low limit switch shall be serpentined across the leaving side of the coil with routing to maximize coil coverage and cover critical top and bottom 3 inches of the coil for any given capillary and coil area configuration. The bends of the capillaries shall be curved and fastened with capillary clips to prevent crimping and minimize wear. Low limit switch shall include a manual reset button. Contacts open on temperature decrease below set point. Set point is default set to 35°F at factory, but is adjustable if increased setpoint is needed due to installation site ducting to coil causing cold spot in a unique location of the coil.

3.1. The fan shall be a single-width, single-inlet, 10-bladed direct-drive plenum fan. The fan shall consist of a backward-curved, welded steel wheel. Motor bearing life of the direct-drive plenum fan shall be not less than L-10 250,000 hrs.

A. Motor Frame
   1. The motor shall be mounted integral to the isolated fan assembly and furnished by the unit manufacturer. The motor is mounted inside the unit casing. The motor shall meet or exceed all NEMA Standards Publication MG 1 requirements and comply with NEMA Premium efficiency levels when applicable except for fractional horsepower motors which are not covered by the NEMA classification. The motor shall be T-frame, squirrel cage with size, type, and electrical characteristics as shown on the equipment schedule.

B. Fan Isolation
   1. All fans shall be internally isolated to inhibit noise and vibration through the ductwork and building structure. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

C. Fan Discharge Temperature Sensor
   1. A button or probe temperature sensor shall be mounted in the fan discharge.
D. Airflow Switch
   1. A differential pressure switch piped to the discharge and suction sides of the fan shall indicate fan status.

4.1.

A. FILTER AND AIR CLEANER SECTION
   1. General: Provide filter sections with filter racks, minimum of one access door for filter removal, and filter block-offs to prevent air bypass.
   2. Permanent Filters:
      a. Media: 2 inch, all-metal, viscous-impingement type, consisting of layers of cleanable wire mesh capable of operating up to a maximum of 625 fpm without loss of efficiency and holding capacity.
      b. Frame: Construct of galvanized steel.
      c. Minimum Efficiency Reporting Value: 2 MERV when tested in accordance with ASHRAE Std 52.2.
   3. Differential Pressure Gauge:
      a. Provide factory installed dial type differential pressure gauge, flush mounted with casing outer wall, and fully piped to both sides of each filter to indicate status.
      b. Maintain plus/minus 5 percent accuracy within operating limits of 20 degrees F to 120 degrees F.

B. DAMPER SECTION
   1. Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor, return, and exhaust air.
   2. Damper Blades:
      a. Double-skin airfoil design with metal, compressible jamb seals and extruded-vinyl blade-edge seals on each blade.
      b. Self-lubricating stainless steel or synthetic sleeve bearings.
      c. Comply with ASHRAE Std 90.1 I-P for rated maximum leakage rate.
      d. Provide leakage testing and pressure ratings in compliance with AMCA 500-D test methods.
      e. Arrange in parallel or opposed-blade configuration.
   3. Barometric Relief Dampers:
      a. Frame: Roll formed galvanized steel.
      b. Blades: Roll formed galvanized steel.
      c. Blade Seals: Extruded vinyl, mechanically attached to the blade edge.
      d. Material:
         1) Galvanized steel, single tie bar linkage for damper sections up to 24 inches wide.

C. AIRFLOW MEASUREMENT
1. Flow Meter:
   a. Provide airflow measurement system to directly measure fan airflow or measure differential pressure that can be used to calculate airflow without interfering with submitted airflow performance and noise levels.
   b. Accuracy: Plus/minus 5 percent (device and transmitter) when operating within the stable operating region of the fan curve.

D. ACCESS SECTION

1. Provide where indicated on drawings to allow for inspection, cleaning, and maintenance of field-installed components.
2. Construct access doors same as previously specified within this Section.

E. CONTROLS

1. Combination VFD - Disconnects:
   a. Provide factory mounted, combination VFD - disconnect for each fan motor.
   b. Factory mount in full metal enclosure and wire to fan motor.
   c. Mount VFD-disconnect on fan section externally in a NEMA 1 enclosure within a dedicated controls section or housed fan section.
      1) Internal Enclosure Construction Characteristics:
         (a) Integral part of unit casing to allow for thermal venting to casing interior.
         (b) Accessible from unit exterior via access door.
         (c) Construction of access doors same throughout unit.
   d. Include circuit breaker disconnect with through-the-door interlocking handle for externally mounted starters, spring loaded, and designed to rest only in the full and lockable ON or OFF state.
   e. Include control transformer with sufficient capacity to support the following items:
      1) VFD and controls.
      2) Binary output on-off wiring.
      3) Analog output speed-signal wiring.
      4) Wires that interface between VFD and direct digital controller.
   f. Mount starter on fan section externally in a NEMA 1 enclosure within a dedicated controls section or housed fan section.
2. Factory Installed Direct Digital Control (DDC) System:
   a. Provide fully functional control system to operate in either stand-alone mode or as part of the building automation system (BAS) via single pair of twisted wires tie-in.
   b. DDC Controller:
      1) Dedicated, field programmable DDC controller with appropriate point capabilities.
      2) Portable Screen and Keypad Capabilities:
         (a) Local monitoring.
         (b) Troubleshooting.
(c) Setpoint adjustments.
(d) Physical plugging compatibility into other factory-configured controllers by same manufacturer.

c. Control Options:

1) Electronic End Devices:
   (a) Accommodate integration into existing building systems.
   (b) Wire to standard point locations of unit mounted DDC controller or terminal block for remote controller.

2) Mixing Section Spring Return Damper Actuators:
   (a) Outdoor Air Damper: Normally closed.
   (b) Return Air Damper: Normally open.

3) Air Flow Measurement Stations: 2 to 10 VDC signal corresponding to CFM for controlling and documenting airflow.

4) Fan Discharge Temperature and Temperature Averaging Sensors: Suitable for integration into the BAS system.

5) Low Limit Switches:
   (a) Factory wire to momentary push-button reset circuit.
   (b) Provide separate low limit for each coil in a coil stack.

6) Airflow Switches: Pipe to both filter sides to indicate fan status.

7) Dirty Filter Switches: Pipe to both filter sides to indicate filter status.

8) Condensate Overflow Switches:
   (a) Comply with UL 508.
   (b) Factory install float switch in drain pan to detect high water condensate level.
   (c) Shut down air handling unit in the event of primary drain blockage.
   (d) Locate float switch above primary drain line connection and below drain pan rim.

9) Provide Relays for each Binary Output of Controller for User Interface of the following:
   (a) Motor starters for supply, return, and exhaust fans.
   (b) Relief dampers.

3. Factory Provided Controls for Field Installation:
   a. Control valves.
   b. Space and outdoor air temperature sensors.

PART 3 EXECUTION

5.1. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bolt sections together with gaskets.
C. Isolate fan section with flexible duct connections.

D. Install flexible duct connections between fan inlet and discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Install assembled unit on vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads. Install restraining snubbers as indicated. Refer to Section 23 0548. Adjust snubbers to prevent tension in flexible connectors when fan is operating.

F. Provide fixed sheaves required for final air balance.

G. Make connections to coils with unions or flanges.

H. Hydronic Coils:
   1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
   2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
   3. Locate water supply at bottom of supply header and return water connection at top.
   4. Provide manual air vents at high points complete with stop valve.
   5. Ensure water coils are drainable and provide drain connection at low points.

5.2. SYSTEM STARTUP
   A. Provide manufacturer's field representative to perform systems startup.

5.3. CLOSEOUT ACTIVITIES
   A. Training: Train Owner's personnel on operation and maintenance of system.
      1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
      2. Provide minimum of two hours of training.

END OF SECTION 23 7313
SECTION 23 8200 - CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.1. SECTION INCLUDES
   
   A. Fan-coil units.
   
   B. Electric baseboard.
   
   C. Electric cabinet unit heaters.

1.2. RELATED REQUIREMENTS
   
   A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.
   
   B. Section 23 0716 - HVAC Equipment Insulation.
   
   C. Section 23 0719 - HVAC Piping Insulation.
   
   D. Section 23 0913 - Instrumentation and Control Devices for HVAC.
   
   E. Section 23 0993 - Sequence of Operations for HVAC Controls.
   
   F. Section 23 2113 - Hydronic Piping.
   
   G. Section 23 2114 - Hydronic Specialties.
   
   H. Section 23 3100 - HVAC Ducts and Casings.

1.3. REFERENCE STANDARDS
   
   
   B. AHRI 440 - Performance Rating of Room Fan-Coil Units; 2008.
   
   C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   

1.4. ADMINISTRATIVE REQUIREMENTS

1.5. SUBMITTALS
   
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   
   B. Product Data: Provide typical catalog of information including arrangements.

1.6. QUALITY ASSURANCE

1.7. WARRANTY
   
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
PART 2 PRODUCTS

2.1. See Section 01 6000 for additional requirements.

2.2. FAN-COIL UNITS

A. Horizontal, Four-pipe System, Ducted:

B. Performance Data and Safety Requirements:
   1. Unit capacities certified in accordance with AHRI 440.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
   3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
   4. Equipment wiring to comply with requirements of NFPA 70.


D. Coils:
   1. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and suitable for working temperatures not less than 200 degrees F. Include manual air vent and drain.
   2. Provide drain pan under cooling coil easily removable for cleaning.
   3. Factory, Hydronic Piping Package: ASTM B 88, Type L copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
      a. Two-way, modulating control valve for chilled-water coil.
      b. Two modulating control valve for heating coil.
      c. Hose Kits: Minimum 400-psig working pressure and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.
         1) Minimum Diameter: Equal to fan coil unit connection size.
      d. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.
      e. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 hose-end, full-port, ball-type blowdown valve in drain connection.
      f. Wrought-Copper Unions: ASME B16.22

E. Horizontal Units:
1. Provide with a galvanized steel chassis, easily removed panels, glass fiber insulation, with mixing air sheet metal plenum insulated to match the chassis with minimum 18 gage, 0.0478 inch thick sheet steel bottom panel.

2. Ducted Units: Provide with air inlet and outlet duct collars and outdoor and return air dampers.

F. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

G. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

H. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

I. Controls:
   1. Provide units with control valves furnished by the fan coil unit manufacturer.
   2. Fan Coil Unit Manufacturer's Controls:
      a. Fan speed switch for unit mounting.
      b. Disconnect switch.
      c. Thermostats and controllers.
   3. Controls Interface:
      a. Relay board.
      b. 24-volt transformer.
      c. Inverting relays for use with standard thermostats and normally open valves.

J. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

K. Electrical Characteristics:
   1. 120 volts, single phase, 60 Hz.

2.3. ELECTRIC BASEBOARD

A. Manufacturers:

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Assembly: Suitable for flush mounting on any floor surface with wire raceway, thermal safety cut-out, and electric terminal box.

D. Heating Elements:
   1. Enclosed nickel chromium wire in steel, stainless steel, or aluminum sheathing or tubing.
   2. Mechanically bonded, aluminum finned, heating elements.
   3. Heating element securely anchored and free-floating for noise free operation.
E. Enclosure:
   1. Minimum 24 gage, 0.0239 inch thick back panel and 20 gage, 0.0359 inch thick sheet steel, exposed front panels, end caps, corners, and joiner pieces.
   2. All joints to snap together without fasteners.
   3. Provide easily removable front panel.

F. Finish:
   1. Factory applied, baked enamel finish.
   2. Color: As selected from color chart.

G. Controls: Wall mounted electric thermostat.

H. Electrical Characteristics: see schedules.

2.4. ELECTRIC UNIT HEATERS

A. Manufacturers:

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Assembly: Suitable for mounting from ceiling or structure above with built-in controls, thermal safety cut-out, and electric terminal box.

D. Acceptable Heating Element Assemblies:

E. Housing:

F. Air Inlets and Outlets:
   1. Inlets: Provide stamped louvers or protective grilles with fan blade guard.
   2. Outlets: Provide diffuser cones, directional louvers, or radial diffusers.

G. Fan: Factory balanced, direct drive, axial type with fan guard.

H. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.

I. Controls:

J. Electrical Characteristics:

2.5. ELECTRIC CABINET UNIT HEATERS

A. Manufacturers:

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Heating Elements: Provide finned tubular or resistance wire enclosed in steel sheath.

D. Cabinet: Minimum 18 gage, 0.0478 inch thick steel front panel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet, and inlet grilles.

E. Finish:
   1. Factory applied, painted finish.
   2. Color: As selected from color chart.

F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

G. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

H. Controls:
   1. Thermostat.

I. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Do not damage equipment or finishes.

D. Baseboard Radiation:
   1. Center elements under window.
   2. Install end caps where units butt against walls.

E. Cabinet Unit Heaters:
   1. Coordinate to ensure correct recess size for recessed units.

F. Fan-Coil Units:
   1. Install as indicated.

G. Units with Hydronic Coils:
   1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
   2. If not easily accessible, extend air vent to exterior surface of cabinet for ease of servicing.
H. Units with Cooling Coils: Connect drain pan to condensate drain.

END OF SECTION 23 8200
SECTION 26 0010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. This Section supplements Division 1, General Requirements.

B. Where contradictions occur between this Section and Division 1, the more stringent of the two shall apply. Architect and Engineer shall decide which is most stringent.

C. Provisions of this section shall also apply to all sections of Division 26 and Division 28.

D. The specifications are complementary to the drawings and their requirements shall have the same priority as the drawings.

1.2. COORDINATION WITH OTHER TRADES

A. Contract Documents:

1. General: The Contract Documents are diagrammatic, showing certain physical relationships which must be established within the electrical work and its interface with other work. Such establishment is the exclusive responsibility of the Contractor. Drawings shall not be scaled for the purpose of establishing material quantities.

2. Work out all conditions in advance of installation. If necessary, and before work proceeds in those areas, prepare coordination drawings showing all work in congested areas. Provide additional work necessary to overcome congested conditions at no increase in contract sum.

3. Coordinate the electrical work to the progress of the work of other trades.

4. Complete the entire installation as soon as the condition of the building will permit.

5. Coordinate ceiling cavity space carefully with all trades. In the event of conflict, install electrical and electric systems within the cavity space allocation in the following order:
   a. Lighting.
   b. Steam and condensate piping.
   c. Plumbing piping.
   d. Mechanical ductwork.
   e. Fire sprinkler piping.
   f. Air diffusers.
   g. Domestic water piping.
   h. Hydronic piping.
   i. Pneumatic control piping.

B. Discrepancies:

1. Examine Drawings and Specifications.

2. Report any discrepancies to the Architect and obtain written instructions before proceeding.
3. Should there be a conflict within or between the Specifications or Drawings, the more stringent or higher quality requirements shall apply. The determination of the more stringent or higher quality shall lie with the Engineer.

4. Items called for in either specifications or drawings shall be required as if called for in both.

5. Be responsible for providing proper documentation of equipment product data and shop drawings to all entities providing service.

6. Coordination Drawings:
   a. Acceptance by the Architect does not imply acceptance of any deviations from contract documents requirements or acceptance of uncoordinated work. Review is for general conformance to the design concept and general compliance with the information given in the contract documents.

1.3. COORDINATION WITH EXISTING OCCUPIED AREAS

A. Minimize disruptions to operation of electrical systems in occupied areas.

B. Coordinate any required disruptions with the Owner, one week in advance.

C. Provide temporary connections to prevent long disruptions.

1.4. DELEGATED DESIGN BY CONTRACTOR

A. The construction of this building requires the Contractor to design several systems or subsystems. All such designs shall be the complete responsibility of the Contractor.

B. Systems or subsystems which require engineering responsibility by the Contractor include, but are not limited to:
   1. Any system not fully detailed.
   2. Equipment supports, not fully detailed.
   3. Conduit hangers and anchors not specified in these documents, or catalogued by the manufacturer.
   4. Lighting controls and wiring.
   5. Conduit systems for Video, Data, Nurse Call, and Fire Alarm.

1.5. REGULATORY REQUIREMENTS

A. Codes: Comply with the codes adopted by authority having jurisdiction:
   1. Applicable editions of NFPA.
   2. Requirements of Fire Departments serving the project.
   3. Regulations of the Health Department having jurisdiction.
   4. Regulations of the Office of State Fire Marshal or its equivalent.
   5. Americans with Disabilities Act (ADA).

B. Other Regulations: Comply with the latest applicable regulations and ordinances of the following:
   1. U. S. and State Department of Labor Safety Regulations pertaining to the completed project.
   2. Clean Air Act.

4. Requirements of product listings by nationally recognized listing agencies as recognized by the Occupational Safety and Hazards Agency (OSHA) and the Architect / Engineer.

C. Contradictions: Where Codes are contradictory, follow the most stringent, unless otherwise indicated in Plans or Specifications. Architect (Engineer) shall determine which is most stringent.

D. Contract Documents Not in Compliance:

1. Where the Drawings and Specifications do not comply with the minimum requirements of the Codes, either notify the Architect (Engineer) in writing during the Bidding Period of the revisions required to meet Code requirements, or provide an installation which complies with the Code requirements. After entering into contract, Contractor will be held to complete all work necessary to meet these requirements without additional expense to the Owner.

E. Codes area minimum requirement approved by the AHJ, in many cases the Project Documents will exceed the minimum requirements of the codes, Project Documents must be be followed.

F. Inspections and Tests:

1. Inspections and tests required shall be completed by a third party NETA Testing Agency/Contractor. Contractor shall arrange for all required inspections and testing.

2. Contractor shall pay all inspections and testing charges.

3. Notify Architect (Engineer) two (2) business days before tests.

4. Inspections reports and Test Reports shall be provide to the Architect (Engineer) for review and shall be included in the final Record Documents.

1.6. OWNER-FURNISHED EQUIPMENT

A. All equipment called out in the Specifications or shown on the Drawings as "Owner-Furnished Equipment" or equipment furnished by other Divisions shall be installed and connected under this Contract. Provide rough-ins for all future connections indicated.

1.7. INSTALLATION GENERAL REQUIREMENTS

A. Furnish, apply, install, connect, erect, clean, and condition manufactured materials and equipment as recommended in manufacturer's printed directions (maintained on job site during installation).

B. Provide all attachment devices and materials necessary to secure materials together or to other materials.

C. Make allowance for ample and normal expansion and contraction for all building components and piping systems that are subject to such.

D. Install materials only when conditions of temperature, moisture, humidity, and conditions of adjacent building components are conducive to achieving the best installation results.

E. Erect, install, and secure components in a structurally sound and appropriate manner.

F. Where necessary, temporarily brace, shore, or otherwise support members until final connections are installed.

G. Leave all temporary bracing, shoring, or other structural supports in place as long as practical for safety and to maintain proper alignment.
H. Handle materials in a manner to prevent scratching, abrating, distortion, chipping, breaking, or other disfigurement.

I. Conduct work in a manner to avoid injury or damage to previously placed work. Any work so impaired or damaged shall be replaced at no expense to Owner.

J. Fabricate and install materials true to line, plumb, and level.

K. Leave finished surfaces smooth and flat, free from wrinkles, warps, scratches, dents, and other imperfections.

L. Furnish materials in longest practical lengths and largest practical sizes to avoid all unnecessary jointing.

M. Make all joints secure, tightly fitted, and as inconspicuous as possible by the best accepted practice in joining and fabricating.

N. Contact Architect (Engineer) for mounting height or position of any unit not specifically indicated or located on Drawings or specified in Specifications.

O. Job mixed multi-component materials used in the work shall be mixed in such regulated and properly sized batches that material can be used before it begins to "set."

P. Mixing of a partially "set" batch with another batch of fresh materials will not be accepted and entire batch shall be discarded and removed from site.

Q. Clean all mixing tools and appliances that can be contaminated prior to mixing of fresh materials.

R. In addition to the above, refer to each Section of the Specifications for additional installation requirements for the proper completion of all work.

2.1. GENERAL

A. Any manufacturer not listed shall be considered a substitution. Follow substitution instructions in Front End Documents.

B. Coordination of general equivalents and substitutions: Where Contract Documents permit selection from several general equivalents, or where substitutions are authorized, coordinate clearance and other interface requirements with electrical and other work.

1. Provide necessary additional items so that selected or substituted item operates equivalent to the basis of design and properly fits in the available space allocated for the basis of design.

2. Provide all features which are standard and specified on the basis of design.

3. Contractor is responsible for assuring that piping, conduit, duct, flue, and other service locations for general equivalents or substitutions do not cause access, service, or operational difficulties any greater than would be encountered with the basis of design. Acceptance by the Architect does not imply acceptance of any deviations from contract documents requirements.

4. Confirm if modifications to electrical, structural or architectural requirements for substituted or general equivalents are needed such as: wire size, conduit size, MCA, MOCP, weight, support, etc. Coordinate with General and Electrical Contractors prior to bid.
PART 3 – EXECUTION

3.1. COORDINATION OF ELECTRICAL INSTALLATION.

A. Inspection and Preparation:
   1. Examine the work interfacing with electrical work, and the conditions under which the work will be performed, and notify the Architect (Engineer) of conditions detrimental to the proper completion of the work.
   2. Do not proceed with the work until unsatisfactory conditions have been corrected. Lack of notifying Architect (Engineer) of conditions is in no way cause for change order request.

B. Layout:
   1. Layout the electrical work in conformity with the Contract Drawings, Coordination Drawings and other Shop Drawings, product data and similar requirements so that the entire electrical plant will perform as an integrated system, properly interfaced with other work, recognizing that portions of the work are shown only in diagrammatic form.
   2. Where coordination requirements conflict with individual system requirements, comply with the Architect's (Engineer's) decision on resolution of the conflict.
   3. Take necessary field measurements to determine space and connection requirements.
   4. Provide sizes and shapes of equipment so the final installation conforms to the intent of the Contract Documents.

C. Integrate electrical work in ceiling spaces with suspension system, light fixtures and other work so that required performances of each will be achieved.

3.2. PRODUCT INSTALLATION

A. Manufacturer's Instructions:
   1. Except where more stringent requirements are indicated, comply with the product manufacturer's instructions and recommendations.
   2. Consult with manufacturer's technical representatives, who are recognized as technical experts, for specific instructions on special project conditions.
   3. If a conflict exists, notify the Architect / Engineer in writing and obtain his instruction before proceeding with the work in question.

B. Movement of Equipment:
   1. Wherever possible, arrange for the movement and positioning of equipment so that enclosing partitions, walls and roofs will not be delayed or need to be removed.
   2. Otherwise, advise Contractor of opening requirements to be maintained for the subsequent entry of equipment.

C. Heavy Equipment:
   1. Coordinate the movement of heavy items with shoring and bracing so that the building structure will not be overloaded during the movement and installation.
   2. Where electrical products to be installed on an existing roof are too heavy to be hand-carried, do not transport across the existing roof deck; position by crane or other device so as to avoid overloading the roof deck.
D. Return Air Path: Coordinate electrical work in return air plenum to avoid obstructing return air path.
   1. Do not make changes in layout which will reduce return air path cross-sectional areas. Minimum cross-sectional area will provide an average of 500 fpm and a maximum of 750 fpm velocity through return air plenum at specified supply air quantity unless otherwise noted.
   2. Report any obstructions by work of other Divisions to Architect / Engineer.

E. Support:
   1. Anchor and secure all equipment to the building substrate and structure.

F. Clearances:
   1. Install conduit and cables:
      a. Straight and true.
      b. Aligned with other work and with general lines of the building.
      c. Concealed, where possible, in occupied spaces.
      d. Out-of-the-way with maximum passageway and headroom remaining in each space.
   2. Except as otherwise indicated, arrange electrical services and overhead equipment with a minimum of:
      a. 7'6" headroom in storage spaces. Do not obstruct windows, doors or other openings.
   3. Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).

3.3. PROTECTION OF WORK

   A. All conduit ends, panelboards, motor controls, disconnecting means, and equipment left unconnected shall be capped, plugged or otherwise properly protected to prevent damage or the intrusion of foreign matter.

   B. Any equipment or conduit system found to have been damaged or contaminated shall be replaced or cleaned to the Engineer's satisfaction.

3.4. ADJUSTING

   A. Adjust all equipment and system components as shown or as otherwise required to result in intended system operation.

   B. At completion of work, provide written certification that all systems are functioning properly without defects.

3.5. START-UP

   A. Assign a Start-Up Coordinator to this project.

   B. The Start-Up Coordinator shall develop detailed start-up procedures, equipment checkout procedure and data forms for recording compliance with contract document performance criteria, and will assist in developing schedules for checkout and Owner acceptance.

   C. The Start-Up Coordinator shall be responsible for maintaining documentation of Start-Up activities until final acceptance of the project.
D. The documentation shall be kept current by the Start-Up Coordinator and shall be available for inspection at all times. At the time of acceptance of the project, the Start-Up Coordinator shall surrender 3 completed copies of the documentation to the Owner's representative.

1. Coordinate with the mechanical installation the requirements for the startup of mechanical and plumbing systems:
   a. All equipment, components, and systems have been set, started-up, and adjusted including checking the following: proper equipment electrical rotation, control connections, factory trained technician startup, etc.
   b. All electric power connections, disconnects, fuses, circuit breakers, etc. are properly sized and installed.

3.6. TRAINING

A. Refer to Division 1 sections of the specifications regarding requirements of Record Drawings, Operation and Maintenance Manual submittal and systems training.
   1. Demonstrate that each system operates properly.
   2. Explain the operation of each system to the Owner's Representative.
   3. Explain use of O&M manual in operating and maintaining systems.
   4. Date, time, and duration of training will be determined by Owner.
   5. Training agendas and schedules shall be developed and approved by Owner, Commissioning Authority, Engineer, and Architect prior to training.
   6. Document and turn over to owner the training sessions on DVD and placed in O&M Manuals. At the end of all sessions, compile all sessions on a single DVD and turn over to owner as part of the O & M manuals.

B. For specific systems requiring extended instruction, refer to individual Division 26 sections.

END OF SECTION 26 0010
SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Single conductor building wire.
B. Metal-clad cable.
C. Wiring connectors.
D. Electrical tape.
E. Oxide inhibiting compound.
F. Wire pulling lubricant.
G. Cable ties.

1.2. RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3. REFERENCE STANDARDS

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.


M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.


O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.


Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

R. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
1.7. DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8. FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1. CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      1) Maximum Length: 6 feet.

2.2. CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:
1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      2) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:
   a. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
   d. For control circuits, comply with manufacturer's recommended color code.

2.3. SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:
   b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.4. METAL-CLAD CABLE

A. Manufacturers:

1. AFC Cable Systems Inc: www.afcweb.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.

   1. Provide additional isolated/insulated grounding conductor where indicated or required.

H. Armor: Steel, interlocked tape.

2.5. WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 0526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
4. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

F. Mechanical Connectors: Provide bolted type or set-screw type.

G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.6. WIRING ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.
PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3. INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
   8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.


H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):
   a. Use listed fittings.
   b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.


O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

Q. Identify conductors and cables in accordance with Section 26 0553.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 0519
SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.

1.2. RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
C. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3. REFERENCE STANDARDS

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field quality control test reports.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

E. Pole-Mounted Luminaires: Also comply with Section 26 5600.

2.2. GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use compression connectors for accessible connections.
   3. Manufacturers - Mechanical and Compression Connectors:
      e. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

   A. Verify that work likely to damage grounding and bonding system components has been completed.
   B. Verify that field measurements are as indicated.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

   A. Install products in accordance with manufacturer's instructions.
   B. Perform work in accordance with NECA 1 (general workmanship).
   C. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Compression Connectors: Secure connections using manufacturer’s recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 0526
SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.1. SECTION INCLUDES

   A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2. RELATED REQUIREMENTS

   A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

   B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

   C. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

   D. Section 26 0533.16 - BOXES: Additional support and attachment requirements for boxes.

   E. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

   F. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3. REFERENCE STANDARDS


   D. MFMA-4 - Metal Framing Standards Publication; 2004.

   E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

   F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

   G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

   A. Coordination:

      1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

      2. Coordinate the work with other trades to provide additional framing and materials required for installation.

      3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6. QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

E. Installer Qualifications for Field-Welding: As specified in Section 05 5000.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 05 5000.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
   3. Manufacturers:
      e. Substitutions: See Section 01 6000 - Product Requirements.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
   1. Manufacturers:
      e. Substitutions: See Section 01 6000 - Product Requirements.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.


5. Manufacturers:
   c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
   e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
      c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
      d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
      e. Outlet Boxes: 1/4 inch diameter.
      f. Luminaires: 1/4 inch diameter.

G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
   4. Manufacturers:
      d. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

H. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are permitted only as follows:
    a. Where approved by Architect.
    b. Use only threaded studs; do not use pins.
11. Hammer-driven anchors and fasteners are permitted only as follows:
    a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
    b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    b. Channel Material: Use galvanized steel.
    c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
    d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
14. Manufacturers - Mechanical Anchors:
    b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.
15. Manufacturers - Powder-Actuated Fastening Systems:
    b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com/#sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.
PART 3  EXECUTION

3.1.  EXAMINATION

A.  Verify that field measurements are as indicated.
B.  Verify that mounting surfaces are ready to receive support and attachment components.
C.  Verify that conditions are satisfactory for installation prior to starting work.

3.2.  INSTALLATION

A.  Install products in accordance with manufacturer's instructions.
B.  Perform work in accordance with NECA 1 (general workmanship).
C.  Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
D.  Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
E.  Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
F.  Unless specifically indicated or approved by Architect, do not provide support from roof deck.
G.  Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
H.  Field-Welding (where approved by Architect): Comply with Section 05 5000.
I.  Equipment Support and Attachment:
   1.  Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2.  Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3.  Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4.  Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
   5.  Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
J.  Conduit Support and Attachment: Also comply with Section 26 0533.13.
K.  Cable Tray Support and Attachment: Also comply with Section 26 0536.
L.  Box Support and Attachment: Also comply with Section 26 0533.16.
M.  Busway Support and Attachment: Also comply with Section 26 2513.
N.  Interior Luminaire Support and Attachment: Also comply with Section 26 5100.
O. Exterior Luminaire Support and Attachment: Also comply with Section 26 5600.

P. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

Q. Secure fasteners according to manufacturer's recommended torque settings.

R. Remove temporary supports.

S. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 0529
SECTION 26 0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Intermediate metal conduit (IMC).
C. Liquidtight flexible metal conduit (LFMC).
D. Electrical metallic tubing (EMT).
E. Rigid polyvinyl chloride (PVC) conduit.
F. Conduit fittings.
G. Accessories.

1.2. RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.
B. Section 07 8400 - Firestopping.
C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.
E. Section 26 0529 - Hangers and Supports for Electrical Systems.
F. Section 26 0533.16 - BOXES.
G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3. REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

L. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

P. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:
1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.
1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer’s instructions.

PART 2 PRODUCTS

2.1. CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection.

7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.

D. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

E. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
G. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet in warehouse areas.

I. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

K. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

L. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

2.2. CONDUIT REQUIREMENTS

A. Fittings for Grounding and Bonding: Also comply with Section 26 0526.

B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4 inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Control Circuits: 3/4 inch (21 mm) trade size.
   4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
   5. Underground, Interior: 3/4 inch (21 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
2.3. GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4. INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
   1. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.

4. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5. LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
   1. Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.6. ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
   d. Substitutions: See Section 01 6000 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

   a. Do not use indenter type connectors and couplings.

5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.7. RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.8. ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive conduits.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.
   8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   9. Arrange conduit to provide no more than 150 feet between pull points.
  10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
   a. Heaters.
   b. Hot water piping.
   c. Flues.

14. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).

9. Use of spring steel conduit clips for support of conduits is not permitted.

10. Use of wire for support of conduits is not permitted.

11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.

7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
   6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
   7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
   9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
   10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

J. Underground Installation:
   1. Minimum Cover, Unless Otherwise Indicated or Required:
   2. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length for service entrance where not concrete-encased.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
   1. Include proposed conduit arrangement with submittals.
   2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
   3. Install conduits within middle one third of slab thickness.
   4. Secure conduits to prevent floating or movement during pouring of concrete.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 3000 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

P. Provide grounding and bonding in accordance with Section 26 0526.

Q. Identify conduits in accordance with Section 26 0553.

3.3. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.4. CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5. PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 0533.13
SECTION 26 0533.16 - BOXES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
C. Floor boxes.

1.2. RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.
B. Section 07 8400 - Firestopping.
C. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
E. Section 26 0529 - Hangers and Supports for Electrical Systems.
F. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
H. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Poke-through assemblies.
   5. Additional requirements for locating boxes for wiring devices.
I. Section 26 2813 - Fuses: Spare fuse cabinets.

1.3. REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.


J. UL 508A - Industrial Control Panels; 2013.


1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
   8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and floor boxes.

C. Samples:
   1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.
D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, and floor boxes.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.6. QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.
   B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
   C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING
   A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. BOXES
   A. General Requirements:
      1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
      2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
      3. Provide products listed, classified, and labeled as suitable for the purpose intended.
      4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
      5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
   B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
      1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
      2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
      3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
      4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
      5. Use suitable concrete type boxes where flush-mounted in concrete.
      6. Use suitable masonry type boxes where flush-mounted in masonry walls.
7. Use raised covers suitable for the type of wall construction and device configuration where required.
8. Use shallow boxes where required by the type of wall construction.
9. Do not use "through-wall" boxes designed for access from both sides of wall.
10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. Minimum Box Size, Unless Otherwise Indicated:
   a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
   b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
   c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
15. Wall Plates: Comply with Section 26 2726.
16. Manufacturers:
   f. Substitutions: See Section 01 6000 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
   a. Indoor Clean, Dry Locations: Type 1, painted steel.
   b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
   a. Provide hinged-cover enclosures unless otherwise indicated.
   b. Boxes 6 square feet and Larger: Provide hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
   a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
d. Substitutions: See Section 01 6000 - Product Requirements.

D. Floor Boxes:
   1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
   2. Use cast iron floor boxes within slab on grade.
   3. Use sheet-steel or cast iron floor boxes within slab above grade.
   4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
   5. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that mounting surfaces are ready to receive boxes.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
   C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
   D. Provide separate boxes for emergency power and normal power systems.
   E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
   F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
   G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
   H. Box Locations:
      1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
      2. Unless dimensioned, box locations indicated are approximate.
      3. Locate boxes as required for devices installed under other sections or by others.
a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Install flush-mounted boxes on opposite sides of walls in different stud spaces, boxes shall not be installed back to back.

7. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
   a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
   b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.

11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
   a. Concealed above accessible suspended ceilings.
   b. Within joists in areas with no ceiling.
   c. Electrical rooms.
   d. Mechanical equipment rooms.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
   4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Floor-Mounted Cabinets: Mount on properly sized nominal 4 inch high concrete pad constructed in accordance with Section 03 3000.

M. Install boxes as required to preserve insulation integrity.

N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

Q. Close unused box openings.

R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S. Provide grounding and bonding in accordance with Section 26 0526.

T. Identify boxes in accordance with Section 26 0553.

3.3. CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4. PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 0533.16
SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Electrical identification requirements.
B. Identification nameplates and labels.
C. Wire and cable markers.
D. Voltage markers.
E. Floor marking tape.
F. Warning signs and labels.

1.2. RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting.
B. Section 09 9123 - Interior Painting.
C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.3. REFERENCE STANDARDS

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7. FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1. IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Panelboards:
   1) Identify ampere rating.
   2) Identify voltage and phase.
   3) Identify power source and circuit number. Include location.
   4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
   5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

b. Enclosed switches, circuit breakers, and motor controllers:
   1) Identify voltage and phase.
   2) Identify power source and circuit number. Include location.
   3) Identify load(s) served. Include location.

c. Time Switches:
   1) Identify load(s) served and associated circuits controlled. Include location.

d. Enclosed Contactors:
   1) Identify ampere rating.
   2) Identify voltage and phase.
   3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
   4) Identify coil voltage.
5) Identify load(s) and associated circuits controlled. Include location.

2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.

3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.

4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

6. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.

7. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 9123 and 09 9113.

8. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

a. At each source and load connection.

b. Within boxes when more than one circuit is present.

c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.

2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.

a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

1) Color Code:

(a) Emergency Power System: Red.
(b) Fire Alarm System: Red.

2) Field-Painting: Comply with Section 09 9123 and 09 9113.

3) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use voltage markers or color coded boxes to identify systems other than normal power system.
   a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.

3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
   a. For exposed boxes in public areas, use only identification labels.

4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.

2. Use identification label to identify fire alarm system devices.

3. Use engraved wallplate to identify serving branch circuit for all receptacles.

4. Use engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

2.2. IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
   a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
   d. Substitutions: See Section 01 6000 - Product Requirements.

   a. Use only for indoor locations.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend:
      a. System designation where applicable:
         1) Emergency Power System: Identify with text "EMERGENCY".
         2) Fire Alarm System: Identify with text "FIRE ALARM".
      b. Equipment designation or other approved description.
      c. Other information as indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch.
      b. Equipment Designation: 1/2 inch.
      c. Other Information: 1/4 inch.
      d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
   5. Color:

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   5. Color: Black text on white background unless otherwise indicated.
E. Format for Caution and Warning Messages:
   1. Minimum Size: 2 inches by 4 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/2 inch.
   5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Power source and circuit number or other designation indicated.
      a. Include voltage and phase for other than 120 V, single phase circuits.
   3. Text: All capitalized unless otherwise indicated.
   5. Color: Black text on clear background.

G. Format for Control Device Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Load controlled or other designation indicated.
   3. Text: All capitalized unless otherwise indicated.
   5. Color: Black text on clear background.

H. Format for Fire Alarm Device Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Designation indicated and device zone or address.
   3. Text: All capitalized unless otherwise indicated.
   5. Color: Red text on white background.

2.3. WIRE AND CABLE MARKERS

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.
B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
   1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.4. VOLTAGE MARKERS

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
   2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
   3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.

E. Legend:
   1. Markers for Voltage Identification: Highest voltage present.
   2. Markers for System Identification:
      a. Emergency Power System: Text "EMERGENCY".
      b. Other Systems: Type of service.

F. Color: Black text on orange background unless otherwise indicated.

2.5. FLOOR MARKING TAPE

A. Manufacturers:
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.6. WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
      a. Do not use labels designed to be completed using handwritten text.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1. PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2. INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Secure rigid signs using stainless steel screws.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.3. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 0553
SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Occupancy sensors.
B. Outdoor motion sensors.
C. Time switches.
D. In-wall time switches.
E. In-wall interval timers.
F. Outdoor photo controls.
G. Daylighting controls.

1.2. RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.
C. Section 26 0533.16 - BOXES.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
   1. Includes finish requirements for wall controls specified in this section.
   2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
F. Section 26 5100 - Interior Lighting.
G. Section 26 5600 - Exterior Lighting.

1.3. REFERENCE STANDARDS

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
LIGHTING CONTROL DEVICES

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.


L. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
   2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
D. Samples (if requested):
   1. Occupancy Sensors: One for each type and color specified.
   2. In-Wall Time Switches: One for each type and color specified.
   3. In-Wall Interval Timers: One for each type and color specified.
   4. Daylighting Control Photo Sensors: One for each type and color specified.

E. Field Quality Control Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include detailed information on device programming and setup.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.

I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8. FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

D. Provide two year manufacturer warranty for all daylighting controls.
PART 2  PRODUCTS

2.1. LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2. OCCUPANCY SENSORS

A. Manufacturers:

1. Hubbell Building Automation, Inc: www.hubbellautomation.com
4. Acuity Controls: www.Acuitybrands.com
6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.

2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.

4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.

5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.

7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.

11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

14. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

15. Wireless Sensors:
   a. RF Range: 30 feet through typical construction materials.
   c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
      c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
      d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
      e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
      f. Provide selectable audible alert to notify occupant of impending load turn-off.
      g. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
      h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:
   1. General Requirements:
a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.

b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

e. Provide field adjustable dimming preset for occupied state.

f. Provide fade-to-off operation to notify occupant of impending load turn-off.

g. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.


E. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:
   a. Description: Low profile occupancy sensors designed for ceiling installation.
   b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
   c. Provide field selectable setting for disabling LED motion detector visual indicator.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
   e. Finish: White unless otherwise indicated.

2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

F. Power Packs for Low Voltage Occupancy Sensors:

   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
   2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.
   4. Load Rating: As required to control the load indicated on drawings.

G. Power Packs for Wireless Occupancy Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.

2. Input Supply Voltage: Dual rated for 120/277 V ac.

3. Load Rating: As required to control the load indicated on drawings.

4. Provide auxiliary contact closure output where indicated.

5. Rated Life of Relay: One million cycles.

H. Accessories:

1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors for occupancy sensors located in Gymnasiums and other locations as indicated on drawings.

2. OUTDOOR PHOTO CONTROLS

A. Manufacturers:

1. Intermatic, Inc; www.intermatic.com/#sle.

2. Tork, a division of NSI Industries LLC; www.tork.com/#sle.

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Stem-Mounted Outdoor Photo Controls:

1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.

2. Housing: Weatherproof, impact resistant polycarbonate.


4. Provide external sliding shield for field adjustment of light level activation.

5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

6. Voltage: As required to control the load indicated on the drawings.

7. Failure Mode: Fails to the on position.

8. Load Rating: As required to control the load indicated on the drawings.

9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

C. Locking Receptacle-Mounted Outdoor Photo Controls

1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.

2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.


4. Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.

5. Voltage: As required to control the load indicated on the drawings.

6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

D. Button Type Outdoor Photo Controls
1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
4. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

PART 3 EXECUTION

3.1. EXAMINATION
A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
D. Verify that final surface finishes are complete, including painting.
E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
G. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION
A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3. INSTALLATION
A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
b. In-Wall Time Switches: 48 inches above finished floor.
c. In-Wall Interval Timers: 48 inches above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.

G. Provide required supports in accordance with Section 26 0529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 0553.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
O. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.4. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5. ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.6. CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.
3.7. CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   4. Location: At project site.

END OF SECTION 26 0923
SECTION 26 2416 - PANELBOARDS

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Lighting and appliance panelboards.
B. Overcurrent protective devices for panelboards.

1.2. RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.
C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3. REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.
D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
E. NEMA PB 1 - Panelboards; 2011.
F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
K. UL 67 - Panelboards; Current Edition, Including All Revisions.
L. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   4. Include documentation of listed series ratings upon request.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Two of each different key.
   3. See Section 26 2813 for requirements for spare fuses and spare fuse cabinets.

1.6. QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.
   B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
   C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING
   A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
   B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
   C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8. FIELD CONDITIONS
   A. Maintain ambient temperature within the following limits during and after installation of panelboards:
      1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1. MANUFACTURERS
   B. Schneider Electric; Square D Products: www.schneider-electric.us.
   D. Substitutions: See Section 01 6000 - Product Requirements.
   E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2. PANELBOARDS - GENERAL REQUIREMENTS
   A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: NEMA 250, Type 1.
      d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
      e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
      d. Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
J. Load centers are not acceptable.

2.3. LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   2. Phase and Neutral Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4. OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Copper, suitable for terminating copper conductors only.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

b. Provide interchangeable trip units where indicated.

5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

6. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
   c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
   d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
   e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

7. Do not use tandem circuit breakers.

8. Do not use handle ties in lieu of multi-pole circuit breakers.

9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

10. Provide the following features and accessories where indicated or where required to complete installation:
    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
    c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
    d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
    e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.5. SOURCE QUALITY CONTROL

   A. See Section 01 4000 - Quality Requirements, for additional requirements.
   
   B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1. EXAMINATION

   A. Verify that field measurements are as indicated.
   
   B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive panelboards.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
E. Provide required supports in accordance with Section 26 0529.
F. Install panelboards plumb.
G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
K. Provide grounding and bonding in accordance with Section 26 0526.
L. Install all field-installed branch devices, components, and accessories.
M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
N. Provide filler plates to cover unused spaces in panelboards.
O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.
   5. Video surveillance system circuits.
P. Identify panelboards in accordance with Section 26 0553.

3.3. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
   1. Perform insulation-resistance tests on all control wiring with respect to ground.
   2. Test functions of the trip unit by means of secondary injection.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4. ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5. CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2416
SECTION 26 2726 - WIRING DEVICES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Wall switches.
B. Wall dimmers.
C. Receptacles.
D. Wall plates.
E. Floor box service fittings.

1.2. RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
C. Section 26 0533.16 - BOXES.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.
F. Section 26 2913 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.

1.3. REFERENCE STANDARDS

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.


L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.
   2. GFCI Receptacles: Include information on status indicators.

D. Project Record Documents: Record actual installed locations of wiring devices.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
1.7. DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

C. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
D. Substitutions: See Section 01 6000 - Product Requirements.
E. Source Limitations: Where possible, provide products for each type of wiring device produced by a single manufacturer and obtained from a single supplier.
F. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

2.2. WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
D. Provide tamper resistant receptacles for receptacles installed as shown on drawings.
E. Provide GFCI protection for receptacles installed within 6 feet of sinks.
F. Provide GFCI protection for receptacles installed in kitchens.
G. Provide GFCI protection for receptacles serving electric drinking fountains.
H. Unless noted otherwise, do not use combination switch/receptacle devices.
I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.3. WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.
B. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
D. Flush Floor Box Service Fittings: White wiring devices with aluminum cover and ring/flange.
2.4. ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes:

2.5. WALL SWITCHES

A. Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.6. WALL DIMMERS

A. Manufacturers:
   2. Greengate/Copper Lighting: www.coperindustries.com
   3. Wattstopper: www.wattstopper.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.7. RECEPTACLES

A. Manufacturers:
4. Substitutions: See Section 01 6000 - Product Requirements.
5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
4. USB/Duplex Receptacle: Industrial specification grade, 20A, 125V, NEMA 5-20R; duplex with Two USB charging ports. Overall 3.1A USB charging capability.
5. USB Charging Station Receptacle: Industrial specification grade, 125V, Four USB charging ports. Overall 4.2A USB charging capability.

D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   a. Provide test and reset buttons of same color as device.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.8. WALL PLATES

A. Manufacturers:
4. Substitutions: See Section 01 6000 - Product Requirements.
5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.9. FLOOR BOX SERVICE FITTINGS

A. Manufacturers:

B. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:
   1. Dual Service Flush Combination Outlets:
      a. Cover: Rectangular.
      b. Configuration:
         1) Power: Two standard convenience duplex receptacle(s) with duplex flap opening(s).
         2) Voice and Data Jacks: Provided by others.
   2. Accessories:
      a. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

H. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3. INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches above finished floor.
      b. Wall Dimmers: 48 inches above finished floor.
      c. Receptacles: 18 inches above finished floor or 6 inches above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtauls not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Q. Identify wiring devices in accordance with Section 26 0553.

3.4. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

C. Inspect each wiring device for damage and defects.

D. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5. ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.
3.6. CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 2726
SECTION 26 2813 - FUSES

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Fuses.

1.2. RELATED REQUIREMENTS

A. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 2416 - Panelboards: Fusible switches.

C. Section 26 2816.16 - Enclosed Switches: Fusible switches.

1.3. REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.


1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   a. Fusible Enclosed Switches: See Section 26 2816.16.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

   1. Spare Fuse Cabinet: Include dimensions.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

   1. See Section 01 6000 - Product Requirements, for additional provisions.

   2. Extra Fuses: One set(s) of three for each type and size installed.
3. Fuse Pullers: One set(s) compatible with each type and size installed.
4. Spare Fuse Cabinet Keys: Two.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1. MANUFACTURERS

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2. APPLICATIONS

A. Feeders:
   1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

B. Individual Motor Branch Circuits: Class RK1, time-delay.

2.3. FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
C. Provide fuses of the same type, rating, and manufacturer within the same switch.
D. Comply with UL 248-1.
E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
F. Voltage Rating: Suitable for circuit voltage.
G. Class R Fuses: Comply with UL 248-12.
   1. Class RK1, Fast-Acting, Non-Time-Delay Fuses:
H. Provide the following accessories where indicated or where required to complete installation:
   1. Fuseholders: Compatible with indicated fuses.
2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3  EXECUTION

3.1.  EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2.  INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet where indicated.

D. Identify spare fuse cabinet in accordance with Section 26 0553.

END OF SECTION 26 2813
SECTION 26 2816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Enclosed safety switches.

1.2. RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2813 - Fuses.

1.3. REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.


E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.


H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.


1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
1.5. SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and
      other installed components and accessories.
   C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit
      current ratings, conduit entry locations, conductor terminal information, and installed features and
      accessories.
      1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with
         all required clearances indicated.
      2. Include wiring diagrams showing all factory and field connections.
   D. Field Quality Control Test Reports.
   E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated
      by product testing agency. Include instructions for storage, handling, protection, examination,
      preparation, installation, and starting of product.
   F. Project Record Documents: Record actual locations of enclosed switches.
   G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures
      and intervals.
   H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
      1. See Section 01 6000 - Product Requirements, for additional provisions.

1.6. QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.
   B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
   C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this
      section with minimum three years documented experience.
   D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally
      Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING
   A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy
      plastic cover to protect units from dirt, water, construction debris, and traffic.
   B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed
      switch internal components, enclosure, and finish.

1.8. FIELD CONDITIONS
   A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of
      enclosed switches.
PART 2 PRODUCTS

2.1. MANUFACTURERS


B. Schneider Electric; Square D Products: www.schneider-electric.us.


D. Substitutions: See Section 01 6000 - Product Requirements.

E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2. ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Ratings:
      a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following
      installation locations:
         a. Indoor Clean, Dry Locations: Type 1.
         b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise
      indicated.

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability
   of overriding interlock for testing purposes.

N. Heavy Duty Switches:
   2. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Copper, suitable for terminating copper conductors only.
   3. Provide externally operable handle with means for locking in the OFF position, capable of
      accepting three padlocks.
      a. Provide means for locking handle in the ON position where indicated.

O. Provide the following features and accessories where indicated or where required to complete
   installation:
   1. Hubs: As required for environment type; sized to accept conduits to be installed.
   2. Integral fuse pullers.
   3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact
      operation before switch blades open and after switch blades close.
   4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with
      door closed.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
   C. Verify that mounting surfaces are ready to receive enclosed safety switches.
   D. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Perform work in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Identify enclosed switches in accordance with Section 26 0553.

3.3. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4. ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5. CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2816.16
SECTION 26 5100 - INTERIOR LIGHTING

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Interior luminaires.
B. Exit signs.
C. Drivers.
D. Luminaire accessories.

1.2. RELATED REQUIREMENTS

A. Section 26 0533.16 - BOXES.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
E. Section 26 5600 - Exterior Lighting.

1.3. REFERENCE STANDARDS

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.
C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
L. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.
M. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
S. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
a. Include estimated useful life, calculated based on IES LM-80 test data.
b. Include IES LM-79 test report upon request.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

3. Ballasts: Include wiring diagrams and list of compatible lamp configurations.

4. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

5. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

E. Samples:
   1. Provide one sample(s) of each specified luminaire where indicated.
   2. Provide one sample(s) of each luminaire proposed for substitution upon request.
   3. Provide one sample(s) of each product finish illustrating color and texture upon request.

F. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.

G. Field quality control reports.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
   3. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   4. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
   5. Extra LED drivers: Ten percent of total quantity installed for each type of driver, but not less than two of each type.

K. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8. FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

C. Provide two year manufacturer warranty for all linear fluorescent ballasts.

D. Provide five year pro-rata warranty for batteries for emergency lighting units.

E. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

F. Provide three year full warranty for fluorescent emergency power supply units.

PART 2 PRODUCTS

2.1. MANUFACTURERS - LUMINAIRS

A. Furnish products from one of the Manufacturers listed in the luminaire schedule found on the drawings.

B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

2.2. LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

2.3. LUMINAIREs

A. Manufacturers:

   1. Acceptable Manufacturers for each type of luminaire are listed on the luminaire schedule on the drawings.
2. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Recessed Luminaires:
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.4. EXIT SIGNS

A. Manufacturers - Powered and Self-Luminous Signs:
   1. Acceptable Manufacturers for each type of luminaire are listed on the luminaire schedule on the drawings.
   2. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

B. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

C. Self-Powered Exit Signs:
1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.

3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

4. Provide low-voltage disconnect to prevent battery damage from deep discharge.

D. Accessories:

1. Provide compatible accessory high impact polycarbonate vandal shields for exit signs located in Gymnasiums.

2.5. DRIVERS

A. Manufacturers:


5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.

6. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.6. ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Tube Guards for Linear Fluorescent Lamps: Provide clear virgin polycarbonate sleeves with endcaps where indicated.
PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3. INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
   7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Remote Drivers: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.

N. Install lamps in each luminaire.

3.4. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5. ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.
3.6. CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7. CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.8. PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5100
SECTION 26 5600 - EXTERIOR LIGHTING

PART 1  GENERAL

1.1. SECTION INCLUDES
A. Exterior luminaires.
B. Luminaire accessories.

1.2. RELATED REQUIREMENTS
A. Section 03 3000 - Cast-In-Place Concrete: Materials and installation requirements for concrete bases for poles.
B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
C. Section 26 0533.16 - BOXES.
D. Section 26 0919 - Enclosed Contactors: Lighting contactors.
E. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.
F. Section 26 5100 - Interior Lighting.

1.3. REFERENCE STANDARDS
1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Provide photometric calculations where luminaires are proposed for substitution upon request.
   2. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
   3. Lamps: Include rated life and initial and mean lumen output.
   4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

E. Samples:
1. Provide one sample(s) of each specified luminaire where indicated.
2. Provide one sample(s) of each luminaire proposed for substitution upon request.
3. Provide one sample of each product finish illustrating color and texture upon request.

F. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

G. Field Quality Control Reports.
   1. Include test report indicating measured illumination levels.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
   4. Extra LED drivers: Ten percent of total quantity installed for each type, but not less than two of each type.
   5. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
   6. Touch-Up Paint: 2 gallons, to match color of pole finish.

K. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6. QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.8. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Furnish products from one of the Manufacturers listed in the luminare schedule found on the drawings.

B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

2.2. LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

2.3. LUMINAIRES

A. Manufacturers:
   1. Acceptable Manufacturers for each type of luminaire are listed on the luminaire schedule on the drawings.
   2. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Provide luminaires listed and labeled as suitable for wet locations where indicated.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.
J. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.4. DRIVERS

A. Manufacturers:

1. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
2. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.5. ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.
3.3. INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires in accordance with NECA/IESNA 501.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.

G. Pole-Mounted Luminaires:
   1. Maintain the following minimum clearances:
   2. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
      e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
      f. Install anchor base covers or anchor bolt covers as indicated.
   3. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
   5. Install non-breakaway in-line fuse holders and fuses complying with Section 26 2813 in pole handhole or transformer base for each ungrounded conductor.
6. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 2726 in designated poles.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.4. FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5. ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.6. CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7. CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8. PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 5600
SECTION 31 1000 - SITE CLEARING

PART 1 GENERAL

1.1. SECTION INCLUDES
   A. Clearing and protection of vegetation.
   B. Removal of existing debris.

1.2. RELATED REQUIREMENTS
   A. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.3. SUBMITTALS
   A. See Section 01 3300 - Submittals, for submittal procedures

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1. SITE CLEARING
   A. Comply with other requirements specified in Section 01 7000.
   B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.2. EXISTING UTILITIES AND BUILT ELEMENTS
   A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
   B. Utility information shown on the plans are based on data provided by the client. Contractor shall use caution during excavation and repair any existing utilities damaged during excavation.
   C. Protect existing utilities to remain from damage.
   D. Do not disrupt public utilities without permit from authority having jurisdiction. Do not disrupt privatae utilities without permission from the owner.
   E. Protect existing structures and other elements that are not to be removed.

3.3. VEGETATION
   A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds.
   B. Do not remove or damage vegetation beyond the limits indicated on drawings.
   C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
      1. As indicated on the plans.
D. Vegetation Removed: Do not burn, bury, landfill, or leave on site.
   1. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   2. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

E. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.4. DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 31 1000
SECTION 31 2316 - EXCAVATION

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, and site structures.

B. Trenching for utilities outside the building.

1.2. RELATED REQUIREMENTS

A. Document SCI NO. 2004-0063.10, TASK 100: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 1000 - Site Clearing: Vegetation and existing debris removal.

C. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

D. Section 31 2323 - Fill: Fill materials, backfilling, and compacting.

1.3. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures

B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

PART 2  PRODUCTS

2.1. MATERIALS

A. Bedding and Fill to Correct Over-Excavation:

1. See Section 31 2323 for bedding and corrective fill materials at general excavations.

2. See Section 31 2316.13 for bedding and corrective fill materials at utility trenches.

PART 3  EXECUTION

3.1. EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.2. PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 1000 for clearing, grubbing, and removal of existing debris.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect plants, lawns, rock outcroppings, and other features to remain.
F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.3. EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

E. Soil removal and replacement under footings and slabs
   1. Under foundations and floor slabs, soil shall be removed to a minimum depth of 2 feet beneath the bottom standard shallow spread footing and 3 feet beneath the bearing elevation of the floor slabs
   2. Over excavations shall extend at least 2 feet beyond the outside edge of the footing and building footprint.

3.4. SUBGRADE PREPARATION

A. See Section 31 2323 for subgrade preparation at general excavations.

3.5. FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. See Section 31 2323 for fill, backfill, and compaction requirements at general excavations.

3.6. FIELD QUALITY CONTROL

A. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.7. CLEANING

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.

B. Remove excess excavated material from site.

3.8. PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION 31 2316
SECTION 31 2316.13 - TRENCHING

PART 1  GENERAL

1.1.  SECTION INCLUDES

   A. Backfilling and compacting for utilities outside the building as shown on plans.

1.2.  RELATED REQUIREMENTS

   A. Section 31 2316 - Excavation:  Building and foundation excavating.

   B. Section 31 2323 - Fill: Backfilling at building and foundations.

1.3.  DEFINITIONS

   A. Finish Grade Elevations:  Indicated on drawings.

1.4.  REFERENCE STANDARDS


   D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).


   F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

   G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.5.  SUBMITTALS

   A. See Section 01 3300 - Submittals, for submittal procedures

   B. Compaction Density Test Reports.

PART 2  PRODUCTS

2.1.  FILL MATERIALS

   A. General Fill: Subsoil excavated on-site.

      1. Graded.

      2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Structural Fill - Fill Type: Subsoil excavated on-site.

C. Granular Fill: Coarse aggregate, conforming to State of Missouri Highway Department standard.

2.2. ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2. PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Notify utility company to remove and relocate utilities.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.3. TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Remove excess excavated material from site.

I. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4. PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.5. BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade, and similar construction: 98 percent of maximum dry density.

I. Reshape and re-compact fills subjected to vehicular traffic.

3.6. BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Utility Piping, Conduits, and Duct Bank,


2. Cover with general fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

3.7. FIELD QUALITY CONTROL

A. Perform compaction density testing on compacted fill in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
3.8. CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 31 2316.13
SECTION 31 2323 - FILL

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.
B. Backfilling and compacting for utilities outside the building to utility main connections.
C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.2. RELATED REQUIREMENTS

A. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.
B. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.3. DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.4. REFERENCE STANDARDS

B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures
B. Compaction Density Test Reports.

1.6. DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles where designated by the Owner.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1. FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
1. Graded.
2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
4. Liquid limit: 45
5. Plasticity index (PI): 25

B. Granular Fill: Coarse aggregate, conforming to State of Missouri Highway Department standard.

C. Topsoil: Topsoil excavated on-site.
   1. Graded.
   2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
   3. Acidity range (pH) of 5.5 to 7.5.
   4. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify that survey bench marks and intended elevations for the Work are as indicated.
   B. Identify required lines, levels, contours, and datum locations.
   C. Verify areas to be filled are not compromised with surface or ground water.

3.2. PREPARATION
   A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
   B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
   C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
   D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3. FILLING
   A. Fill to contours and elevations indicated using unfrozen materials.
   B. Employ a placement method that does not disturb or damage other work.
   C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
   D. Maintain optimum moisture content of fill materials to attain required compaction density.
   E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
   F. Correct areas that are over-excavated.
      1. Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry density.
G. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 90 percent of maximum dry density.
   2. At landscape areas: 88 percent of maximum dry density.
   3. At other locations: 90 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4. FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.

C. At Foundation Walls and Footings:
   1. Use general fill.
   2. Compact each lift to 90 percent of maximum dry density.
   3. Do not backfill against unsupported foundation walls.
   4. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

D. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
   2. Cover with general fill.
   3. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

E. At Lawn Areas:
   1. Use general fill.
   2. Fill up to 6 inches below finish grade elevations.
   3. Compact to 95 percent of maximum dry density.

F. At Planting Areas Other Than Lawns:
   1. Use general fill.
   2. Compact to 95 percent of maximum dry density.

G. Under Monolithic Paving and Monolithic Paver Setting Beds:
   1. Compact subsoil to 95 percent of its maximum dry density before placing fill.
   2. Use general fill.
   3. Fill up to subgrade elevation.
4. Compact to 95 percent of maximum dry density.
5. See Section 32 1123 for aggregate base course placed over fill.

3.5. TOLERANCES
   A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.6. FIELD QUALITY CONTROL
   A. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor") or AASHTO T 180.
   B. If tests indicate work does not meet specified requirements, remove work, replace and retest.
   C. Frequency of Tests: Every other lift.
   D. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.7. CLEANING
   A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 31 2323
SECTION 32 1123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.1. SECTION INCLUDES

   A. Aggregate base course.

1.2. RELATED REQUIREMENTS

   A. Section 31 2323 - Fill: Compacted fill under base course.
   B. Section 32 1313 - Concrete Paving: Finish concrete surface course.
   C. Section 32 1413 - Precast Concrete Unit Paving.

1.3. REFERENCE STANDARDS

   C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

1.4. SUBMITTALS

   A. See Section 01 3300 - Submittals, for submittal procedures
   B. Materials Sources: Submit name of imported materials source.
   C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

1.5. DELIVERY, STORAGE, AND HANDLING

   A. When aggregate materials need to be stored on site, locate where directed by Owner.
   B. Aggregate Storage, General:
      1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
      2. Prevent contamination.
      3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1. MATERIALS

   A. Coarse Aggregate: Coarse aggregate, conforming to State of Missouri Highway Department standard.
   B. Fine Aggregate: Sand; conforming to State of Missouri Highway Department standard.
2.2. SOURCE QUALITY CONTROL

   A. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

PART 3 EXECUTION

3.1. EXAMINATION

   A. Verify that survey bench marks and intended elevations for the work are as indicated.

   B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2. PREPARATION

   A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

   B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.3. INSTALLATION

   A. Under Portland Cement Concrete Paving:

      1. Place coarse aggregate to a total compacted thickness of 4 inches.

      2. Compact to 95 percent of maximum dry density.

   B. Place aggregate in maximum 4 inch layers and roller compact to specified density.

   C. Level and contour surfaces to elevations and gradients indicated.

   D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

   E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

   F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4. CLEANING

   A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 32 1123
SECTION 32 1313 - CONCRETE PAVING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Concrete sidewalks, integral curbs, and parking areas.

1.2. RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.
B. Section 03 3000 - Cast-in-Place Concrete.
C. Section 07 9200 - Joint Sealants: Sealing joints.
D. Section 31 2323 - Fill: Compacted subbase for paving.

1.3. REFERENCE STANDARDS

B. ACI 301 - Specifications for Structural Concrete; 2016.
O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.


1.4. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.1. FORM MATERIALS

A. Form Materials: As specified in Section 03 1000, conform to ACI 301.

2.2. REINFORCEMENT

A. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.

B. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.3. CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.


C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.

D. Fly Ash: ASTM C618, Class C or F.

E. Water: Clean, and not detrimental to concrete.

F. Air-Entraining Admixtures: ASTM C260/C260M.


2.4. ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class B.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

2.5. CONCRETE MIX DESIGN
   A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
      1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
   B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
   C. Concrete Properties:
      1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4000 psi.
      2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
      3. Water-Cement Ratio: Maximum 45 percent by weight.
      4. Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.
      5. Maximum Slump: 4 inches.

2.6. MIXING
   A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
   B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.1. EXAMINATION
   A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
   B. Verify gradients and elevations of base are correct.

3.2. SUBBASE
   A. Re-use existing subbase in place.

3.3. PREPARATION
   A. Moisten base to minimize absorption of water from fresh concrete.

3.4. FORMING
   A. Place and secure forms to correct location, dimension, profile, and gradient.
   B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.5. REINFORCEMENT
   A. Place reinforcement as indicated.

3.6. COLD AND HOT WEATHER CONCRETING
   A. Follow recommendations of ACI 305R when concreting during hot weather.
B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.7. PLACING CONCRETE

A. Do not place concrete when base surface is wet.

B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.8. JOINTS

A. Align curb, gutter, and sidewalk joints.

3.9. FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

3.10. TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.11. FIELD QUALITY CONTROL

A. Contractor to provide all quality control testing.

1. Provide free access to concrete operations at project site and cooperate with appointed firm.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.

1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.12. PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION 32 1313
SECTION 32 1413 - CONCRETE PAVER MATERIALS

PART 1   GENERAL

1.1. SUMMARY

A. Section includes the following:
   1. Concrete Pavers
   2. Joint Sand
   3. Setting Bed Sand
   4. Base Aggregate

1.2. REFERENCES

A. ASTM International, latest edition:
   4. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
   6. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
   7. C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
   9. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
  10. D 1557 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (44.5 N) Rammer and 18 in. (457 mm) drop.
  11. C1645 Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units
  13. D 2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports.

B. Illinois Department of Transportation:
   1. Standard Specifications for Road and Bridge Construction, January 2010, including all addenda.

1.3. SUBMITTALS

A. Concrete Pavers:
1. Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.

2. Accepted samples become the standard of acceptance for the product produced.

3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.

4. Manufacturer’s catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

1.4. Joint and Setting Bed Sand:
   A. Provide one representative one pound sample in container of Joint Sand materials.
   B. Provide one representative one pound sample in container of Setting Bed Sand materials.
   C. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.

1.5. Base and Subbase Aggregate:
   A. Test results from an independent testing laboratory for sieve analysis per ASTM C 136.

1.6. Paving Installation Contractor:
   A. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.7. QUALITY ASSURANCE
   A. Utilize a Manufacturer having at least ten years of experience manufacturing concrete pavers on projects of similar nature or project size.
   B. Source Limitations:
      1. Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
      2. Obtain Joint and Setting Bed Sands from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
   C. Paving Contractor Qualifications:
      1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
   D. Mockups:
      1. Install a 5 ft x 5 ft paver area per each paving pattern.
      2. Use this area to determine surcharge of the Setting Bed Sand layer, joint sizes, lines, laying pattern(s) and levelness. This area will serve as the standard by which the workmanship will be judged.
      3. Subject to acceptance by owner, mock-up may be retained as part of finished work.
      4. If mock-up is not retained, remove and dispose legally.
1.8. DELIVERY, STORAGE & HANDLING

A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.

B. Deliver Concrete Pavers in manufacturer’s original, unopened and undamaged container packaging with identification labels intact.
   1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
   2. Deliver Concrete Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
   3. Unload Concrete Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.

C. Store and protect materials free from mud, dirt and other foreign materials.

D. Prevent Joint and Setting Bed Sand from exposure to rainfall or removal by wind with secure, waterproof covering.

1.9. PROJECT/SITE CONDITIONS

A. Environmental Requirements:
   1. Install Concrete Pavers only on unfrozen and dry Setting Bed Sand.
   2. Install Concrete Pavers only on unfrozen and dry Base or Subbase Aggregate materials.
   3. Install Base or Subbase Aggregates only over unfrozen subgrade.
   4. Install Setting Bed Sand or Concrete Pavers only when there is no heavy rain or snowfall.

1.10. CONCRETE PAVER OVERAGE AND ATTIC STOCK

A. Provide a minimum of 5% additional material for overage to be used during construction.

B. Contractor to provide (30) pavers of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.

C. Manufacture to supply maintenance and reinstatement manuals for Concrete Paver units.

PART 2 PRODUCTS

2.1. CONCRETE PAVERS

A. Basis-of-Design Product: The Concrete Paver shape is based on:
   1. Hollandstone as manufactured by Unilock, 301 E. Sullivan Road, Aurora, IL 60505. Contact: Doug Johnson, Commercial Product Representative - Unilock Chicago, Inc., (630) 892-9191.
      a. Size: 7.875” x 3.875” x 2.375”
      b. Color: Sierra
      c. Finish: Premier, this is a face mix finish
   2. Alternate Manufacturers:
      a. Holland Stone 60mm by Belgard (An Oldcastle Company), 2405 East 85th Street, Kansas City, MO 64132. Contact Ryan High, Territory Manager, (314) 440-9137.
1. **Concrete Paver Materials**

   a.  Size: 4" x 8" x 60mm (approx. 2.36")
   b.  Color: Burnt Walnut
   c.  Finish: Smooth with Protech

   b. Holland Stone 6cm by Pavestone, 2720 East Outer Road, Scott City, MO 63780, (573) 332-8312.
      a.  Size: 3.94" x 7.87" x 2.36"
      b.  Color: Earth Blend
      c.  Finish: Smooth

3. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
   a. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.

B. **Product requirements:**

   1. Size: Manufacture the paver sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
      a. Note: Imperial dimensions are nominal equivalents to the metric dimensions.

C. **Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.**

   1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
   2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
   3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.

D. **Accept only pigments in concrete pavers conforming to ASTM C 979.**

1. Note: ACI Report No. 212.3R provides guidance on the use of pigments.

E. **Maximum allowable breakage of product is 5%.**

2.2. **JOINT SAND**

A. **Provide natural Joint Sand as follows:**

   1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
   2. Do not use limestone screenings, stone dust, or sand for the Joint Sand material that does not conform to the grading requirements of ASTM C 33.
   3. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.
   4. Gradation as shown in Table 1 below:
2.3. TABLE 1 - JOINT SAND

2.4. GRADATION REQUIREMENTS FOR JOINT SAND

<table>
<thead>
<tr>
<th>ASTM C 144</th>
<th>Natural Sand Percent Passing</th>
<th>Manufactured Sand Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>No. 8 (2.36 mm)</td>
<td>95 to 100</td>
<td>95 to 100</td>
</tr>
<tr>
<td>No. 16 (1.18 mm)</td>
<td>70 to 100</td>
<td>70 to 100</td>
</tr>
<tr>
<td>No. 30 (0.600 mm)</td>
<td>40 to 75</td>
<td>40 to 75</td>
</tr>
<tr>
<td>No. 50 (0.300 mm)</td>
<td>10 to 30</td>
<td>20 to 40</td>
</tr>
<tr>
<td>No. 100 (0.150 mm)</td>
<td>2 to 15</td>
<td>10 to 25</td>
</tr>
<tr>
<td>No. 200 (0.075)</td>
<td>0 to 1</td>
<td>0 to 10</td>
</tr>
</tbody>
</table>

2.5. SETTING BED SAND

A. Provide Setting Bed Sand as follows:

1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.

2. Do not use limestone screenings, stone dust, or sand material that does not conform to the grading requirements of ASTM C 33.

3. Do not use mason sand or sand conforming to ASTM C 144.

4. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.

5. Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 2 below:

2.6. TABLE 2 - SETTING BED SAND

2.7. GRADATION REQUIREMENTS FOR SETTING BED SAND

<table>
<thead>
<tr>
<th>ASTM C 33</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
<td></td>
</tr>
<tr>
<td>3/8 in (9.5 mm)</td>
<td>100</td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>95 to 100</td>
</tr>
<tr>
<td>No. 8 (2.36 mm)</td>
<td>85 to 100</td>
</tr>
<tr>
<td>No. 16 (1.18 mm)</td>
<td>50 to 85</td>
</tr>
<tr>
<td>No. 30 (0.600 mm)</td>
<td>25 to 60</td>
</tr>
<tr>
<td>No. 50 (0.300 mm)</td>
<td>10 to 30</td>
</tr>
<tr>
<td>No. 100 (0.150 mm)</td>
<td>2 to 10</td>
</tr>
<tr>
<td>No. 200 (0.075)</td>
<td>0 to 1</td>
</tr>
</tbody>
</table>

A. Note: Coarser sand than that specified in Table 1 above may be used for joint sand including C 33 material as shown in Table 2. Use material where the largest sieve size easily enters the smallest joints. For example, if the smallest paver joints are 2 mm wide, use sand 2 mm and smaller in particle size. If C 33 sand is used for joint sand, extra effort may be required in sweeping material and compacting the pavers in order to completely fill the joints.
2.8. EDGE RESTRAINTS

A. Metal Edge Restraints:
      a. Material Type: Aluminum
      b. Model No.: A18258M - High Depth Commercial

PART 3 EXECUTION

3.1. EXAMINATION

A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following before placing the Concrete Pavers.
   1. Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
   2. Verify the Concrete Underlayment has cured.
   3. Verify the Concrete Underlayment thickness, strengths, surface tolerances and elevations conform to specified requirements.
   4. Provide written density test results for soil subgrade, Concrete Underlayment P.S.I testing to the Owner, General Contractor and paver installation subcontractor.
   5. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Beginning of Bedding Sand and Concrete Paver installation signifies acceptance of Base and edge restraints.

3.2. PREPARATION

A. Verify the Concrete Underlayment is clean and dry, certified by General Contractor as meeting material, installation and grade specifications.

B. Stockpile Setting Bed Sand and Joint Sand such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

C. Verify that base and Geotextile, if applicable, is ready to support sand, edge restraints, and, pavers and imposed loads.

D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Joint Sand and Setting Bed Sand materials contaminated with sediment with clean materials.

E. Edge Restraint Preparation:
   1. Install edge restraints per the drawings.
   2. Mount directly to finished base. Do not install on bedding sand.
   3. Extend the minimum distance from the outside edge of the Concrete Underlayment to the spikes equal to the thickness of the slab.
3.3. INSTALLATION

A. SETTING BED SAND

1. Provide and spread Setting Bed Sand evenly over the Concrete Underlayment and screed to a nominal thickness of 1 in. (25 mm).
   a. Protect screeded Setting Bed Sand from being disturbed by either pedestrian or vehicular traffic.
   b. Screed only the area which can be covered by pavers in one day.
   c. Do not use Setting Bed Sand material to fill depressions greater in the base surface.

2. Keep moisture content constant and density loose and constant until Concrete Pavers are set and compacted.

3. Screed the Setting Bed Sand using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards.

4. Carefully maintain spread Setting Bed Sand in a loose condition, and protected against incidental compaction, both prior to and following screeding. Loosen any incidentally compacted sand or screeded sand left overnight before further paving units are placed.

5. Provide lightly screeded Setting Bed Sand in a loose condition to the predetermined depth, only slightly ahead of the paving units.

6. Fully protect screed Setting Bed Sand against incidental compaction, including compaction by rain. Remove any screeded Setting Bed Sand that is incidentally compacted prior to laying of the paving units. Do not permit either pedestrian or vehicular traffic on the screeded Setting Bed Sand.

7. Inspect the Setting Bed Sand course prior to commencing the placement of the Concrete Pavers. Acceptance of the Setting Bed Sand occurs with the initiation of Concrete Paver placement.

B. CONCRETE PAVERS

1. Replace Concrete Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).

3. Exercise care in handling face mix concrete pavers to prevent surfaces from contacting backs or edges of other units.

4. Provide Concrete Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.

5. Use string lines or chalk lines on Setting Bed Sand to hold all pattern lines true.

6. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.

7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
   a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
8. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.

9. Prevent joint (bond) lines from shifting more than ±1/2 in. (±13 mm) over 50 ft. (15 m) from string lines.

10. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.

11. Prevent all traffic on installed Concrete Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Concrete Pavers that have not received initial compaction and Joint Sand material.

12. Vibrate Concrete Pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
   a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
   b. Compact installed Concrete Pavers to within 6 feet (2 meters) of the laying face before ending each day’s work. Cover Concrete Pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Setting Bed Sand from becoming disturbed.

13. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.

14. Remove any cracked or structurally damaged Concrete Pavers and replace with new units prior to installing Joint Sand material.

C. JOINT SAND

1. Provide, spread and sweep dry Joint Sand into joints immediately after vibrating pavers into Setting Bed Sand course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.

2. Leave all work to within 3 ft. (1 m) of the laying face fully compacted with sand-filled joints at the completion of each day.

3. Remove excess Joint Sand broom clean from surface when installation is complete.

3.4. FIELD QUALITY CONTROL

A. Verify final elevations for conformance to the drawings after sweeping the surface clean.

1. Prevent final Concrete Paver finished grade elevations from deviating more than ±3/8 in. (±10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.

B. Lippage: No greater than 1/32 in. (0.8 mm) difference in height between Concrete Pavers and adjacent paved surfaces.

3.5. REPAIRING, CLEANING AND SEALING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
   1. Clean Concrete Pavers in accordance with the manufacturer’s written recommendations.
3.6. PROTECTION

   A. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION 32 1413
SECTION 32 3119 - DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Decorative aluminum fences.

1.2. REFERENCE STANDARDS


1.3. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: 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 methods.

C. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

D. Manufacturer's Warranty.

1.4. QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.5. DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Decorative Metal Fences and Gates:
   1. Alumi-Guard; Belmont: www.alumi-guard.com/sle.
2.2. FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:

B. Electro-Deposition Coating: Multi-stage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils, minimum.
   2. Color: As selected by Architect from manufacturer's standard range.

C. Aluminum: ASTM B221.
   1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
   2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
   3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.

D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.

2.3. ALUMINUM FENCE

A. Decorative Aluminum Fence System: Provide fence meeting the Test Load and Coating Performance requirements of ASTM F2408 for Industrial class.
   1. Fence Panels: 6 feet high by 8 feet long.
      b. Panel Strength: Capable of supporting 270 pounds minimum load applied at midspan without deflection.
      c. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.
      d. Posts: Aluminum extrusions, 2-1/2 inches square.
      e. Rails: Extruded aluminum channels.
      f. Pickets: Extruded aluminum tubes.
         1) Style: Pickets with finial extend above top rail.
         2) Integrally Formed Finial: Spear point.
      g. Fasteners: Manufacturer's standard stainless steel bolts, screws, and washers; factory finish fasteners to match fence.
      h. Accessories: Aluminum castings, extrusions and cold-formed strips; factory finished to match fence.
         1) Flat post cap.
      i. Flexibility: Capable of following variable slope of up to 1:4.
      j. Color: As selected by Architect from manufacturer's standard range.

B. Decorative Aluminum Gates:
   1. Gate Panels: Manufacturer's standard decorative aluminum fence panels.
   2. Posts: Aluminum extrusions; 2 inches square.

4. Hardware:
   a. Latch: Manufacturer's standard mechanism; factory finished galvanized steel.

5. Operation: Automatic locking system.
   a. Operator: Comply with UL 325, Class III and ASTM F2200.
   b. Manufacturer's standard electric operating system with integral controls, remote latching and
      unlatching, safety devices, communication devices, and emergency vehicle access.
      1) Contractor shall connect digital entry system to existing power source and fire alarm
         system.

6. Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.1. INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Set fence posts in accordance with the manufacturer recommended spacing.
   C. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf
      dimensions and gate hardware selected.
      1. Base type and quantity of gate hinges on the application; weight, height, and number of gate cycles.
      2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
      3. Provide gate hardware by the manufacturer of the gate and install in compliance with
         manufacturer's recommendations.

3.2. ERECTION TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch.
   B. Maximum Offset From Indicated Position: 1 inch.
   C. Minimum Distance from Property Line: 6 inches.

3.3. CLEANING
   A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away
      from posts. Remove excess material if required.
   B. Clean fence with mild household detergent and clean water rinse well.

3.4. PROTECTION
   A. Protect installed products until completion of project.

END OF SECTION 32 3119
SECTION 32 3223 - SEGMENTAL RETAINING WALLS

PART 2 PRODUCTS

1.1. RETAINING WALLS

1.2. MATERIALS

A. Retaining Wall Units: Machine-formed concrete blocks of shapes and sizes suitable for the retaining wall configuration required and complying with ASTM C1372 and the following:
   1. Face Color: Natural cement gray.
   2. Texture: Split face, on exposed surfaces.
   3. Face Shape: Straight (flat).
   4. Moisture Absorption: 8 percent, maximum.

B. Drainage Filter: Geosynthetic textile.
   1. Apparent Opening Size: 70 to 100 U.S. Sieve size, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491.
   3. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 ounces per square yard.

C. Drainage Fill: Clean, freely draining aggregate placed within, between, or immediately behind segmental retaining wall units; do not use pea gravel; use one of the following:
   1. Aggregate as approved by Architect.
   2. Aggregate meeting requirements of ASTM D448, Size No. 57.
   3. Crushed stone or coarse gravel, 3/8 inch; no more than 5 percent passing No. 200 sieve.
   4. Crushed stone or coarse gravel, meeting requirements of ASTM D7928.

D. Drainage Pipe: 4 inch Perforated schedule 40 PVC, complying with ASTM D3034; or corrugated HDPE complying with ASTM F405; with geotextile filter wrap.

END OF SECTION 32 3223
SECTION 32 9115 - LANDSCAPE SOIL PREPARATION

PART 1 - GENERAL

1.1. SUMMARY

A. The General Conditions and Division - 1 Specification sections apply to the work of this section.

B. The following documents form part of the Specifications to the extent stated. Where differences exist between Codes, Standards, Authorities Having Jurisdiction, and the Documents, the one affording the greatest protection and/or more stringent condition shall apply.

C. Section includes:
   1. Planting Soils
   2. Soil Preparation
   3. Soil Amendments and Fertilizers
   4. Soil Testing
   5. Finish Grading
   6. Weed Control

D. Site and Drawing Examination:
   1. Any sub-contractor submitting a proposal for this work shall first examine the site of the proposed work and all conditions at the site that he may fully understand any facilities, difficulties, and restrictions attending the execution of the contract. No subsequent allowances shall be made because of omission, error, or negligence, in connection with this provision.
   2. Any sub-contractor submitting a proposal for this work shall carefully examine the architectural and structural drawings and specifications in addition to the drawings and specifications for the work in his particular trade.

1.2. RELATED WORK

A. Division 32 Section 9300 “Plant Material & Accessories”

B. Division 32 Section 9200 “Turf”

1.3. DEFINITIONS

A. CEC: Cation exchange capacity.

B. Duff Layer: A surface layer of soil, typical of forested areas that is composed of mostly decayed leaves, twigs, and detritus.

C. Imported Soil: Soil that is transported to Project site for use.

D. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
E. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

F. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. PPM: Parts per million.


J. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

K. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

L. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

M. USCC: U.S. Composting Council.

1.4. PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project Site prior to the commencement of the Landscape Soil Preparation scope. Attendees to include, but are not limited to the design build team and Landscape sub-contractor.

1.5. SITE CONDITIONS

A. Underground Utilities:
   1. Prior to initiating any work of this section, the sub-contractor shall locate and identify all underground utilities.

B. Subgrade Elevations:
   1. Excavation, filling and grading required to establish elevations shown on the drawings are not specified in this section.
   2. Subgrade elevations shall be established prior to placement of landscape soils to allow for placement to depths as indicated and required.
      a. Sub-contractor is responsible to coordinate establishment of subgrade elevations as required for landscape soils.
      b. Conditions in which subgrade elevations have not been provided, sub-contractor is responsible to complete excavation required and properly dispose of resulting spoils off-site.

1.6. QUALITY ASSURANCE

A. Sub-contractor’s Quality Control Responsibilities: Sub-sub-contractor is solely responsible for quality control of the Work.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances
1. and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain
2. necessary approvals from all such authorities.

C. Installer Qualifications: A qualified landscape installer whose work has resulted in successful installation of planting soils and the establishment of exterior plants.
1. Installer to maintain an experienced full-time supervisor on project site when installing soils and when exterior planting is in progress.
2. Landscape sub-contractor shall have experience in the proper and safe transportation and installation of soil material.
3. The Landscape sub-contractor shall prepare and present to the Landscape Architect required soil submittals and their associated specified test results, (6) six months prior to the scheduled soil and plant installation for proper lead time for material locations, initial soil mix testing, and approval. IT is the responsibility of the Landscape sub-contractor, in conjunction with the Soil Supplier to submit material for the soil and compost tests.

D. Soil-Mixing sub-contractor Qualifications:
1. Soil-Mixing sub-contractor shall be able to provide soil mixes that meet the specifications within the tolerances assigned.
2. Soil-Mixing sub-contractor shall be able to produce enough consistently uniform soil material for the project to meet the schedule demands.
3. Soil-Mixing Sub-contractor shall be engaged at least (6) six months prior to scheduled soil installation, to allow for sufficient time for material searches and initial planting mix approval.

E. Soil Testing Agency: All analytical services shall be completed by a qualified testing agency.
Reports and recommendations shall accompany all laboratory data.
1. Tests shall be made in strict compliance with the standards of the Associate of Official Analytical Chemists and follow standards from ASTM, EPA, and/or Methods of Soil Analysis, SSSA.
2. Sub-sub-contractor is responsible for all testing and analysis costs.

F. Analysis and Testing of Materials: For each type of packaged material required for the Work of this section, provide manufacturer’s certified analysis. For all other materials, provide complete analysis by a recognized laboratory mad in strict compliance with the standards and procedures of the following:
1. International Society of Arboriculture (ISA)
2. American Society of Testing Materials (ASTM)
3. American Society of Agronomy (ASA)
4. Environmental Protection Agency (EPA)
5. Soil Science Society of America (SSSA)
6. Associate on Official Agricultural Chemist (AOAC)
1.7. SUBMITTALS AND TESTING

A. Initial Soil Submittals:
   1. Samples – For each bulk-supplied material in sealed containers labeled with content, source, and date obtained: providing an accurate representation of composition, color and texture.
   2. Test Reports – For each bulk-supplied material as outlined in the Test Procedures and Reporting section.
   3. Soil Analysis – Provide Initial Planting Soil Analysis for bulk-supplied material as outlined in the Test Procedures and Reporting section, before materials are blended or delivered to the job site.

B. Amended Soil Mixes:
   1. Samples – For each specified type of amended soil.
   2. Test Reports – For each amended soil mix as outlined in the Test Procedures and Reporting section.
   3. Soil Analysis – Provide Amended Planting Soil Analysis for each amended soil mix as outlined in the Test Procedures and Reporting section.

C. Herbicides
   1. Pre-Emergent
   2. Post-Emergent

1.8. TEST PROCEDURES AND REPORTING:

A. Topsoil – Testing for initial approval shall be tested using the following procedures:
   1. Particle-size distribution by the Pipet method, as outlined in Methods of Soil Analysis, Part 1, 1986. This includes the removal of organic matter and carbonates with hydrogen peroxide.
   2. Saturated hydraulic conductivity, total porosity, and bulk density by ASTM F1815-97 or equivalent Methods of Soil Analysis determination for the tested sample.
   3. Organic matter content (ASTM F1647-02a)
   4. Salts and ammonium test.
   5. Soil chemical and nutrient analysis shall be tested using Methods of Soil Analysis, Parts 1 and 3, 1986 and 1996, or approved equivalent.
   6. Soil moisture testing required prior to soil placement shall be by gravimetric oven dry method, as described in Soil Science Society of America, Methods of Soil Analysis, Part 1, 1986.

B. Composted Organic Materials – Provide analyses of composed organic materials are required prior to initial soil mix acceptance. Analyses shall include all tests required to verify specified criteria in Part 2 of this Section.
C. Amended Planting Soil Mix(s) – The amended soil mix for initial approval shall be tested using

the following procedures:

1. Particle-size distribution (ASTM F1632-03) – Perform for all soil layers. The ASTM F1632 test is acceptable for the loamy sand soil. Fines passing the #270 sieve are to be measured using the hydrometer method, as outlined in ASTM F1632.

2. Saturated hydraulic conductivity, total porosity, and bulk density (ASTM F1815-97) - Perform for all soil layers.

3. Organic matter content (ASTM F1647-02a)

4. Salts and ammonium test.

5. Soil moisture testing required prior to soil placement shall be by gravimetric oven dry method, as described in Soil Science Society of America, Methods of Soil Analysis, Part 1, 1986.

6. Specified topsoil testing for initial approval shall be testing using the following procedures.

D. Initial Amended Planting Soil Analysis:

1. Report suitability of tested soil planting soils for plant growth. Based upon the test results:
   a. Provide required soil treatments and soil amendments to be incorporated to meet Performance Requirements of the planting soil. Rates of treatments and amendments to be provided in weight per 1000 sf. Ft or volume per cu. Yd. for nitrogen, phosphorus, and potash nutrients.
   b. Provide type and quantity of additives required to adjust and/or reduce salt level content.
   c. Provide type and quantity of additives required to establish acceptable pH factor.

2. Soil tests shall be run prior to topsoil sample approval and at Landscape Architect’s discretion throughout topsoil installation.

E. Testing Intervals for Organic Amendments, Planting Soil Mixes, Topsoil, and Subgrade

1. Provide testing at the following intervals:
   a. Amended soil tests: During the placement of planting soils, test every 1000 cubic yards of planting soil mix delivered to the job site. Test shall be for soil mix quality assurance to maintain adherence to particle size distribution, pH, organic matter, salts, and ammonium. Report organic matter content on a percent by weight basis. Testing applies to all soil layers of the Soil Profile.
   b. Testing will be based upon above outline.

PART 2 - PRODUCTS

2.1. PLANTING SOILS SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS

A. Planting-Soil - Ornamental Planting: Imported, Topsoil, naturally formed soil from off-site sources and consisting of sandy clay loam or clay loam according to USDA textures; and modified to produce viable planting soil. Alternate soil textures may be provided pending compliance with Amended Planting Soil Criteria. Amend imported topsoil soil with materials specified in other articles of this Section to become Planting Soil complying with the following requirements:

1. Sources: Take imported, un-amended topsoil from sources that are naturally well-drained
sites where topsoil occurs at least 4 inches deep, not from Agricultural sites, bogs, or marshes; and that do not contain residual agricultural chemicals, undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsnggrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.

2. Additional Properties of Imported Soil before Amending: Minimum of 2 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration. Clean soil to be of the following:
   a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
   b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 4 percent by dry weight of the imported soil.
   c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1-1/2 inches in any dimension.

3. Physical Soil Parameters
   a. CLAY - 5-25%
   b. SILT - 25-50%
   c. SAND - 25-50%

4. Percentage of Organic Matter: Minimum 4% to 8% percent by volume.

5. Soil Reaction: pH of 6 to 7.4

6. CEC of Total Soil: Minimum 12 meq/100 mL at pH of 7.0. Maximum 25 meq/100 mL.

7. Soluble-Salt Content: 1 to 2 dS/m measured by electrical conductivity.

8. Ideal Soil Fertility:
   a. Mehlic III: 110 ppm
   b. Bray II Phosphorus: 175 ppm
   c. Calcium: 65-70% of Base Saturation
   d. Magnesium: 10-17% of Base Saturation
   e. Potassium: 4.5% of Base Saturation
   f. Boron: 1-2 ppm
   g. Iron: 225 ppm
   h. Manganese: 100ppm
   i. Copper: 5 ppm
   j. Zinc: 15 ppm

2.2. INORGANIC SOIL AMENDMENTS

A. The following amendments shall be added as indicated by the Soil Testing Agency in order to achieve the amended Planting Soil(s) Requirements.
1. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent.

2. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

4. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

5. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM F 2396.

6. UMaxx Urea

7. Mono-Ammonium Phosphate

2.3 ORGANIC SOIL AMENDMENTS

A. The following amendments shall be added as indicated by the Soil Testing Agency in order to achieve the amended Planting Soil(s) requirements.

1. Compost: Well-composted, stable, and weed-free organic matter produced by composting well acted leaf matter, and bearing USCC's "Seal of Testing Assurance," and as follows:
   a. Leaf Compost may be utilized. Alternate local forms of compost falling within the specified ranges may be utilizing pending approval from Soil Testing Agency. Biosolids and animal waste will not be accepted.
   b. Reaction: pH stable compost. pH of 6 to 7.2
   c. Soluble-Salt Concentration: Less than 4 dS/m.
   d. Organic-Matter Content: 40 to 60 percent of dry weight.
   e. Particle Size: Minimum of 98 percent passing through a 1-inch sieve.

2.4 FERTILIZERS

A. Fertilizers shall be added as indicated by the Soil Testing Agency in order to achieve the amended Planting Soil(s) requirements. This includes, but is not limited to:


2. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.

3. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water insoluble nitrogen, phosphorus, and potassium.

2.5 MISCELLANEOUS

A. Pesticide: Registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and

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application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergence Herbicide: Sub-sub-contractor to provide Post-Emergence product as required to maintain a weed-free project. Post-emergence product must be compatible with specified planting species.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2. PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix un-amended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Spread un-amended soil to total depth as indicated on the drawings, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil. Amendments shall be applied at rates indicated on Soil Test Analysis and recommendations

   a. Mix lime and sulfur with dry soil before mixing fertilizer. Apply at rates indicated on Soil Test Analysis.

   b. Mix fertilizer with planting soil no more than seven days before planting. Apply at rates indicated on Soil Test Analysis.

2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 6 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 85 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
1. Tolerance: ½ inch variance in 20 feet.
2. Limit fine grading to areas which can be planted immediately after grading.
3. The site shall be free from irregular surface changes and shall vary uniformly between fixed elevations.
4. Restore landscape areas to specified conditions if any eroded locations, ruts, depressions, or settlement exists after fine grading and prior to planting.
5. See Drawings for additional notes.

3.3. APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost component of planting-soil mix at a thickness AS REQUIRED TO MEET PERFORMANCE SPECIFICATIONS of amended soil mixes. Apply compost to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4. FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 2000 sq. ft. of in-place soil or part thereof.
   2. Performance Testing: For each amended planting-soil type, demonstrating compliance with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

B. Soil will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5. WEED CONTROL / TREATMENT

A. All site locations to receive planting where weeds exist, shall be treated with post-emergent herbicide.
   1. Repeat treatment as required to ensure that no weeds are present at the beginning of work on the landscape planting of the Project.

B. Weeds shall not be present at the date of inspection for Beneficial Occupancy of the Project and at the conclusion of the maintenance and establishment period following acceptance of the
   1. Sub-sub-contractor’s work.

C. Post-emergent weed treatment includes:
1. Removal of weeds and other undesirable ground cover vegetation in turf/grass and planting areas shall be accomplished a minimum of 14 days prior to soil preparation for planting operations.

2. Care shall be taken not to affect existing trees, shrubs, and plants to be saved on the site.

3.6. PESICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer’s written recommendations. Coordinate applications with design build team’s operations and others in proximity to the Work. Notify design build team before each application is performed.

3.7. PROTECTION AND CLEANING

A. Protect area of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations.

1. Storage of construction material, debris, or excavated material.

2. Parking vehicles or equipment.

3. Vehicle traffic

4. Foot traffic.

5. Erection of sheds or structures.

6. Impoundment of water.

7. Excavation or other digging unless otherwise indicated.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner’s property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by the design team.

2. All hardscape and paving areas affected by the soil preparation operations shall be thoroughly cleaned by sweeping and power washing.

END OF SECTION 32 9115
SECTION 32 9200 - TURF

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. Seeding.
   2. Lawn Renovation.

B. Related Sections include the following:
   1. Section 31 1000 Site Clearing
   2. Section 31 2000 Earth Moving
   3. Section 32 9100 Landscape Soil Preparation
   4. Section 32 9300 Plant Material & Accessories
   5. Section 32 9500 Landscape Maintenance

1.3. DEFINITIONS

A. Final Acceptance Date: The date the Owner issues the Letter of Final Acceptance.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Maintenance Period: The length of time determined that the contractor shall be responsible for care and maintenance of the turf lawn following installation. This may be before or after substantial completion or both.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Existing, on-site, imported or manufactured soil that has been modified with soil amendments or fertilizers to produce a soil mixture best for plant growth. See Section 32 9100 "Landscape Soil Preparation” and drawings for planting soil type(s) and location(s).

G. Topsoil: Top layer of the soil profile consisting of “Planting Soil” to create the zone where plant roots grow. Its appearance is generally friable, pervious, and its coloring is black or darker shades of brown, gray, or red than the underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.

H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
I. Substantial Completion Date: The date on which the Letter of Substantial Completion is issued.

J. Watering: Application of water through appropriate tools and from approved sources to establish and maintain turf.

1.4. SUBMITTALS

A. Product Information for Verification and Approval: For each type of product indicated, the contractor shall submit the requested information, as provided by the supplier or manufacturer, to the Landscape Architect within 30 Days of Award of Contract.

B. Product samples and data sheets:
   1. Erosion control blanket.
   2. Metal wire staples.

C. Product Certificates:
   1. Grass Seed: From each respective vendor for each grass-seed monostand or mixture, provide certification stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging. Identify the source, including name and telephone number of supplier.
   2. Pre- and Post-Installation Fertilization product information sheet supplied by the product manufacturer.

D. Qualification Data: All seeding and/or landscape installation contractors shall have a minimum of 5 years’ experience in the Landscape Industry performing the described work. Submit references if requested by the Landscape Architect.

E. Planting Schedule: Notify Landscape Architect a minimum of 10 days prior to anticipated start of seeding activities.
   1. Review the project manager's or general contractor's project master schedule as it relates to these planting activities. Notify Landscape Architect in writing of any execution concerns.

F. Maintenance Manual: As part of awarding Substantial Completion Approval contractor shall provide to the owner and Landscape Architect a maintenance manual which consists of the following:
   1. Contact information for the installation contractor company, company owner, and project foreman for both the installation and maintenance.
   2. Installation date(s) of the work or phases of work as well as a copy of the Substantial Completion Certificate once it is available.
   3. Written description of recommended and standard practice maintenance procedures and activities for this project site in an outline and/or spreadsheet format, for a full calendar year and broken down by the month.
   4. Copies of all Submittals provided in Section 1.4, A through E.
   5. Submit printed hardcopy in a 3 ring binder and a digital file of this maintenance manual to the Owner and Landscape Architect.
1.5. QUALITY ASSURANCE

A. Installer Qualifications: An experienced landscape installer who has successfully completed seeded lawn establishment and renovation work similar in material, design, and size to that indicated for this Project and whose work has resulted in construction projects having a record of successful performance during implementation and follow-up maintenance.

B. Soil-Testing Laboratory Qualifications: See section Section 32 9115 “Landscape Soil Preparation”.

C. Planting Soil Analysis: See section Section 32 9115 “Landscape Soil Preparation”.
   1. Review soil test report and provide written analysis (correspondence with) by the testing laboratory regarding the suitability of planting soil for seed germination and lawn growth.
   2. Written analysis shall include recommended quantities of organic or inorganic amendments, minerals, or fertilizers required to be added in order to produce a satisfactory planting soil.

D. Pre-Installation Conference: Conduct a landscape pre-construction conference at the project site in compliance with requirements of Section One. Conference attendees to include owner’s representative, general contractor (construction manager), grading and excavation sub-contractor, pedestrian and vehicular pavement sub-contractor, landscape sub-contractor and installation sub-contractor’s daily on-site superintendent, and Landscape Architect. Agenda items:
   1. Review construction schedule, deliverables related to seeding schedule and installation phases (if any).
   2. Review site access and staging of materials.
   3. Availability of water for turf establishment.
   4. Confirm the installation and coordination of work by other trades and protection of work by others during construction.
   5. Confirm maintenance practices.
   6. Confirm seed mix.
   7. Review determination for satisfactory lawn.

E. Post-Installation Conference: As part of the Substantial Completion walkthrough and prior to the start of the maintenance period, the following shall discuss and review, at a minimum, the following maintenance items. Attendees shall include owner’s representative, general contractor (construction manager), landscape sub-contractor’s foremen for both installation and maintenance and the Landscape Architect. Agenda items:
   1. Review progress of the seeding installation as a whole and/or by phase.
   2. Availability of water for continued turf establishment and maintenance.
   3. A written schedule of preferred fertilizers and/or pesticides and their use.
   4. Clear maintenance direction and protocol for the maintenance contractor going forward.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
1.7.  SCHEDULING

   A. Seeding Restrictions: Install seed during one of the indicated periods. Coordinate planting periods with construction schedule and maintenance period to provide required, uninterrupted maintenance from date of installation through Final Completion.
      2. Fall Planting: August 15th through September 30th.

   B. Weather Limitations:
      1. Proceed with installation only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained.
      2. Apply products during favorable weather conditions according to manufacturer's written instructions.
      3. Do not attempt to install any materials in frozen, wet, or muddy conditions.
      4. Uniformly moisten excessively dry planting soil that is not workable, dusty or not conducive to successful installation.

1.8.  LAWN MAINTENANCE

   A. Begin maintenance operations immediately after each area is planted and continue until final acceptance is given, but for not less than the following periods:
      1. From date of installation up to and until receiving written approval that the work is Substantially Complete.
      2. Continue maintenance for a minimum of 60 days from the date of Substantial Completion and up to Final Acceptance.

   B. Maintenance shall include but is not limited to lawn establishment and care by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations.

   C. Refer to Section 32 9500 “Landscape Maintenance” for additional requirements.

1.9.  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. Special Warranty: Warrant the lawn’s installed, living materials for a period of 90 days after date of Final Acceptance, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents beyond Contractor's control.

PART 2 PRODUCTS

2.1.  SEED

   A. Grass Seed: Fresh, clean, dry, new-crop seed, certified as complying with the standards of the Association of Official Seed Certifying Agencies (AOSCA) and therefore qualifying for their official "blue" certified seed tags for meeting state, federal and international seed law requirements for seed purity and germination tolerances as well as the preservation of genetic purity and varietal identity.
B. Seed Species and Tolerances:
1. Seed Mix Type: Kentucky Bluegrass seed mix shall provide 97% of the seed blend by weight.
2. Not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed.

C. Turf Grass Seed Mix:
   a. 100.00% "Jump Start" Kentucky Bluegrass.
   a. 97.58% Bewitched Kentucky Bluegrass
   b. 2.42% Inert Matter
3. Alternate Seed Blends: Approved Equal. Submit seed mix to Landscape Architect for approval a minimum of 30 days prior to seed installation.

2.2. PLANTING ACCESSORIES

A. Selective Herbicides:
1. EPA registered and approved, of type recommended by manufacturer for application.
2. As submitted to and approved by Landscape Architect.

2.3. FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
C. Starter Fertilizer: Commerical-grade fertilizer blended to promote root growth by supplying essential nutrients near the germinating seed.
   1. Composition: 10 percent nitrogen, 20 percent phosphorous, and 5 percent potassium, by weight.
   2. Review soils report to confirm proper application rate of this product.
D. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
   2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
E. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.4. MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew and seed free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.5. EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable straw fiber, or coconut-fiber mat enclosed in a biodegradable jute fiber net.
   1. Location(s): All slopes exceeding 3:1. See Civil Drawings.
   2. Longevity: 12 Months
   3. Product: Bionet S75BN Erosion Blanket

B. Manufacturer's recommended anchoring device(s):
   1. Biodegradable pins: 4 inches long by ¾” wide.

PART 3 EXECUTION

3.1. EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Confirm that all operations required per Section 32 9115 “Landscape Soil Preparation” have been completed prior to fine grading activities.

C. Confirm that fine grading activities and grade elevations have been met per the drawings.

3.2. PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect adjacent and adjoining areas from hydro-mulch overspray.

B. Provide and install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Apply seed starter fertilizer per manufacturer's recommendations for installation. Installation of fertilizer as part of the drill seeding process is acceptable if the machinery is equipped to perform this operation.
F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.3. SEEDING

A. Sow seed with pull behind drill planting machine with a furrow opened through a double disc system and adjustable seed depth. Do not broadcast or drop seed. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the rate as recommended by the manufacturer or their supplier.

C. Drill machine should place planting soil atop seed for optimal soil-seed contact, roll lightly, and water seeded areas with fine spray.

D. Protect drill-seeded areas from hot, dry weather or drying winds by applying [hydroseed] [straw] mulch within 24 hours after completing seeding operations.

E. Upon completion of seeding operations, apply straw mulch and erosion-control blankets, if required.

3.4. MULCH INSTALLATION

A. Straw Mulch: Protect seeded areas by spreading straw mulch.
   1. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1 ½” in loose depth over seeded areas.
   2. Spread by hand, blower, or other suitable equipment.
   3. Anchor straw by crimping into topsoil with suitable mechanical equipment.

3.5. LAWN RENOVATION

A. Renovate existing lawn damaged by Contractor’s operations, such as but not limited to storage of materials or equipment and movement of vehicles.
   1. Reestablishment of lawn will be required where settlement or washout occurs or where minor regrading is required.

B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

C. Remove topsoil containing foreign materials resulting from Contractor’s operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.

D. Mow, de-thatch, core aerate, and rake existing lawn.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner’s property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

H. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil.

I. Provide new planting soil to fill low spots and meet finish grades.
J. Apply seed and protect with straw as required for new lawns.

K. Water newly planted areas and keep moist until new lawn is established.

3.6. SATISFACTORY LAWNS

A. Substantial Completion Conference: Prior to the start of any maintenance period, schedule a meeting per Section 1.5-E Post-Installation Conference.

B. Satisfactory Seeded Lawn: At end of maintenance period and to gain final acceptance, a healthy, uniform, close stand of grass must be established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. with any bare spots not exceeding 3 by 3 inches in size.

C. Re-establish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7. TURF MAINTENANCE

A. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height in initial mowing and 40% in all subsequent mowings.
   1. Do not delay mowing until grass blades bend over and become matted.
   2. Do not mow when grass is wet.
   3. Schedule mowings to maintain the following minimum grass height: 3 inches.

B. Turf Post-Installation Fertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
   1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.
   2. Apply products per the manufacturer's rate and site condition recommendations and instructions.
   3. Notify the client a minimum of 24 hours in advance of any application.
   4. Apply only those products approved of during post-installation conference.

3.8. PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.9. CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period, excluding erosion blankets and mulch.
3.10. TERMINATION OF THE MAINTENANCE PERIOD

A. Substantial Completion Procedure:
   1. Complete all turf installation per the drawings and specifications including all maintenance requirements.
   2. Submit a written request to the Landscape Architect for a substantial completion meeting on-site. Identify any work not completed or not per the drawings and specifications.
   3. Provide all submittals requirements per Section 1.4

B. Final Acceptance Procedure:
   1. Work will be accepted by the Owner and Landscape Architect upon satisfactory completion of all work, including maintenance period’s corrective or replacement work under the Warranty Period.
   2. Submit a written request to Landscape Architect for review for Final Acceptance at least fifteen (15) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.

C. Corrective Work:
   1. Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
   2. Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.
   3. After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
   4. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and Final Acceptance received in writing.

D. Conditions for Acceptance of Work at End of Maintenance Period:
   1. All seeded areas shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
   2. Correct all locations not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such seeded areas.

END OF SECTION 32 9200
SECTION 32 9300 - PLANT MATERIAL & ACCESSORIES

PART 1 – GENERAL

1.1. SUMMARY

A. Section Includes:
   1. Plant material.
   2. Planting soils.
   3. Tree stabilization.
   4. Organic mulch.
   5. Stone.

B. Related Sections:
   1. Division 02920 Section "Turf Grass".

1.2. DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

G. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

H. Planting Area: Areas to be planted.

I. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

J. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

L. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

M. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

N. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

O. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3. SUBMITTALS

A. Product Data: Submit the following no later than 60 days after Notice to Proceed.
   2. Plant Fertilizer cut sheets.
   3. Contractor qualifications.

B. Samples for Verification: Submit the following at least 30 days prior to installation of plant material:
   1. Organic and Stone Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
   2. Stone Samples: 1 sample of each finish type of variable size that indicates full range of color for stone type.

C. Warranty/Maintenance: Submit the following at the Final Completion Inspection:
   1. Warranty: Provide a one (1) year written guarantee for all plant material.
   2. Maintenance Instructions: Submit written recommendations procedures for landscape maintenance for one (1) calendar year.

1.4. QUALITY ASSURANCE

A. Installer Qualifications: A landscape contractor with a minimum of 5 year’s experience. Submit company qualifications and examples of at least (3) similar projects.

B. Soil-Testing Laboratory Qualifications: See Specification 32 Section 9115 "Landscape Soil Preparation".

C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
   1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches
or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.

2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

E. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of plant sources a minimum of 30 days prior to the commencement of planting operations.

F. Pre-installation Conference: Conduct one conference at Project site a minimum of (14) calendar days prior to the start of work.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.6. PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without Owner's written permission.

C. Planting Restrictions: Plant during one of the following periods, unless submitted in writing and approved otherwise by Landscape Architect. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 15 to June 1.
2. Fall Planting: August 15 to November 15

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.7. WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
   b. Structural failures including plantings falling or blowing over.
   c. Faulty performance of tree stabilization.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Final Completion:
   a. Trees, Shrubs, and Ornamental Grasses: 12 months.
   b. Ground Covers, Perennials: 12 months.

3. Include the following remedial actions as a minimum:
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
PART 2 – PRODUCTS

2.1. PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2. ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inc sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; bio-solids; yard trimmings; or source-separated or compostable mixed solid waste.

2.3. FERTILIZERS

A. Slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4. PLANTING SOILS

A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

2. Weight of Commercial Fertilizer per 1000 Sq. Ft.: as recommended by manufacturer.

B. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs, or marshes.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2. Mix imported topsoil or manufactured topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
   b. Weight of Commercial Fertilizer per 1000 Sq. Ft.: as recommended by soil testing reports.

2.5. MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
   1. Type: Shredded Hardwood Mulch
   2. Size Range: 3 inches maximum, 1/2 inch minimum.
   3. Color: Natural

2.6. STONE

A. Natural Limestone Columns, (5) total, for Memorial per Drawings
   2. Size: Each 20"W x 20"D x 50"H at back and 30"H at front per Drawing Details
   3. Color: Gold to Buff
   4. Finish: Per Drawing Details

2.7. TREE STABILIZATION MATERIALS

A. Stakes and Guys:
   1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
   2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.

PART 3 – EXECUTION

3.1. EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2. PREPARATION OF LANDSCAPE AREAS

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

E. Remove all weeds from the proposed landscape beds by doing the following:
   1. Mow weeds to a height of 3” or less.
   2. Apply a total weed killer as recommended by the manufacturer.
   3. Wait a minimum of 5 days and reapply the total weed killer to areas that were not affected by the first application.
   4. After all weeds are dead, remove all dead foliage and lightly till the ground to a depth of 2”.

3.3. PLANTING AREA ESTABLISHMENT

A. Loosen sub-grade of planting areas to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply fertilizer directly to sub-grade before loosening.
2. Thoroughly blend planting soil off-site before spreading.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or sub-grade is frozen, muddy, or excessively wet.
   a. Spread approximately one-half the thickness of planting soil over loosened sub-grade. Mix thoroughly into top 2 inches of sub-grade. Spread remainder of planting soil.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4. EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
   1. Excavate and install per planting details.
   2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
   3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
   4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate sub-grades of adjacent paving, structures, hardscapes, or other new or existing improvements.
   5. Maintain supervision of excavations during working hours.
   6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
   7. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Subsoil and topsoil removed from excavations may be used as planting soil.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
   1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.
3.5. TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
   1. Use planting soil for backfill.
   2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
   3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

D. Set container-grown stock plumb and in center of planting pit or trench with root flare at same elevation as adjacent finish grades.
   1. Use planting soil for backfill.
   2. Carefully remove root ball from container without damaging root ball or plant.
   3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6. MECHANIZED TREE SPADE PLANTING

A. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.

B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

C. Cut exposed roots cleanly during transplanting operations.

D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.

E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.

F. Where possible, orient the tree in the same direction as in its original location.

G. Provide hand excavation and amended soils around the relocated tree per the drawing details.
3.7. TREE STABILIZATION

A. Install trunk stabilization as follows unless otherwise indicated:

1. **Upright Staking and Tying:** Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. **Support trees with bands of flexible ties at contact points with tree trunk.** Allow enough slack to avoid rigid restraint of tree.

3. **Support trees with two strands of tie wire,** connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. **Staking and Guying:** Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches long, driven to grade.

1. **Site-Fabricated Staking-and-Guying Method:**
   a. **Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle.** Allow enough slack to avoid rigid restraint of tree.
   b. **Paint turnbuckles with luminescent white paint.**

3.8. GROUND COVER AND PERENNIAL PLANTING

A. Set out and space ground cover and plants other than trees and shrubs as indicated in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9. PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. **Organic Mulch in Planting Areas:** Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

2. **Apply a weed prevention application of the herbicide “Preen” or approved equal to the finished planting bed.**
3.10. PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11. CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting

END OF SECTION 32 9300
SECTION 32 9447 - LANDSCAPE MAINTENANCE

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 landscape maintenance, complete as specified during progress of the work, after installation, and for a period 60 days from the date of Substantial Completion and up to Final Acceptance.

B. Landscape maintenance work consists of providing all labor, materials, equipment, and incidental supplies necessary to perform described work.

C. Related Sections include the following:
   1. Section 32 9115 Landscape Soil Preparation
   2. Section 32 9200 Turf
   3. Section 32 9300 Plant Material & Accessories

1.3. DEFINITIONS

A. Final Acceptance Date: The date of the Owner issues the Letter of Final Acceptance.

B. Maintenance Manual: A collection of documents gathered by the contractor for the Owner’s records including but not limited to landscape schedules, records, permits, and conditions of planting at Final Acceptance.

C. Maintenance Period: The length of time determined that the contractor shall be responsible for care and maintenance of the turf lawn following installation.

D. Substantial Completion Date: The date on which the Letter of Substantial Completion is issued.

1.4. SUBMITTALS

A. Quality Control Submittals:
   1. Schedule of maintenance operations and monthly status report including list of equipment, materials proposed for the job, and watering schedule.
   2. Licenses, permits, and insurance required by the City of Cape Girardeau, the State and/or Federal government pertaining to maintenance work.
   3. Documentation of existing planting.
   4. Monthly record of all herbicides, insecticides, and disease control chemicals used for the project.
   5. Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the Director of Agriculture proposed for this work.

B. Project Close-out Submittal: Prepare a landscape maintenance manual in the form of a single 3-ring binder containing an indexed collection of documents to include the following:
1. All plant material and accessories schedules, including final plant installation schedule showing substitutions made.

2. Records and permits required as listed above.

3. Documentation of accepted condition of planting at Final Acceptance.

1.5 QUALITY

A. Qualifications:

1. Experience: The landscape contractor or maintenance subcontractor shall have a full-time employee assigned to the job as foreman for the duration of the contract. He/she shall have a minimum of (5) years experience in landscape maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.

2. Labor Force: The landscape maintenance labor force shall be thoroughly familiar with, and trained in, the work to be accomplished and shall perform the tasks in a competent, efficient manner acceptable to the Owner.

B. Requirements:

1. Supervision: The foreman shall directly supervise the work force at all times. Notify Owner of all changes in supervision.

2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner.

3. Post-installation Conference: As part of the Substantial Completion walk-through and prior to the start of the maintenance period, the following shall discuss and review, at a minimum, the following maintenance items. Attendees shall include owner's representative, general contractor (construction manager), landscape sub-contractor's foremen for both installation and maintenance and the Landscape Architect. Agenda items:

   a. Review progress of the plant and turf installation as a whole and/or by phase.
   b. Availability of water for continued plant and turf maintenance.
   c. A written schedule of preferred fertilizers and/or pesticides and their use.
   d. Clear maintenance direction and protocol for the maintenance contractor going forward.

C. The contractor shall be liable for any damage to the grounds, building or equipment caused by the activities and or negligence of its employees.

1.6 PROJECT/SITE CONDITIONS

A. Site Visit: At the beginning of the maintenance period, visit and walk the site with the Owner's representative to clarify scope of work and understand existing project/site conditions.

B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are healthy, thriving, damaged, dead or dying.

1.7 SEQUENCING AND SCHEDULING

A. Perform all maintenance during hours mutually agreed upon between Owner and Contractor.

B. Work force shall be present at the project site a minimum of once per week and as often as necessary to perform maintenance in accordance with the approved maintenance schedule.
1.8. WARRANTY
   A. For specific requirements, refer to the following sections:
      1. Section 32 9200 - Turf
      2. Section 32 9300 - Plant Material & Accessories

PART 2 - PRODUCTS

2.1. MATERIALS
   A. All materials and equipment shall be provided by the contractor, unless otherwise specified below.
   B. Water: Clean, potable, and fresh, as available from Owner.
   C. Fertilizers:
      1. Tightly-compressed, slow-release and long-lasting complete fertilizer tablets bearing manufacturer's label of guaranteed analysis of chemicals present.
      2. Balanced, once-a-season application, controlled-release fertilizers with a blend of coated prills which supply controlled-release Nitrogen, Phosphorus, and Potassium, and uncoated, rapid soluble prills containing Nitrogen and Phosphorus.
   D. Herbicides, Insecticides and Fungicides:
      1. Best quality materials with original manufacturer's containers, properly labeled with guaranteed analysis.
      2. Use non-staining materials.
   E. Annuals/Perennials: Nursery-grown pots, full, healthy plants just ready to bloom, and of matching size and species.
   F. Lawn Seed for Re-seeding: Match seed mix from Specification Section 32 9200 "Turf".
   G. Mulch: Match mulch from Specification Section 32 9300 "Plant Material & Accessories".
   H. Replacement tree guys, stakes, ties, and wires: Match approved materials from Drawings.

2.2. EQUIPMENT
   A. Use only the proper tool for each job. Maintain all tools in sharp, properly functioning condition. Clean and sterilize pruning tools prior to usage.
   B. Take all measures to prevent introduction of insect or disease-laden materials onto the site. See Section 32 9300 "Plant Material & Accessories".

PART 3 - EXECUTION

3.1. ESTABLISHING THE MAINTENANCE PERIOD
   A. Preliminary Review: As soon as letter of substantial Completion is issued, hold a preliminary review to determine condition of the work.
   B. Date of Review: Notify Landscape Architect at least six (6) working days prior to anticipated date of review.
C. Beginning of the Maintenance Period: The date on which the Landscape Architect issues a letter of Substantial Completion to the contractor.

3.2. PREPARATION

A. Protection

1. Protect all new planting areas from damage of all kinds from beginning of work until sufficiently established or until Final Acceptance.
2. Provide temporary protection fences, barriers, and signs as required for protection.
3. Notify the Owner 24 hours in advance of any chemical application procedures. Identify the exact locations being treated and the chemicals to be used. Furnish to Owner for approval, MSDS sheets for all chemicals to be used prior to application. Areas being treated shall be flagged or marked per state and local requirements.
4. Do not mow, walk, or use any piece of equipment on turf areas when frost is present.
5. Do not mow any turf areas if they are saturated with water or standing water is present.

B. Replacements:

1. Immediately treat or replace all plants which became damaged or injured as a result of Contractor's operations or negligence, as directed by Landscape Architect, at no cost to Owner.
2. Replacement shall match size, condition, and variety of plant replaced.

3.3. PLANTING

A. Watering Basins:

1. Maintain all watering basins around plants so that enough water can be applied to establish moisture through major root zones.
2. For supplemental hand watering of watering basins, use a water wand to break the water force. Do not permit use of "jet" type water equipment. Do not permit crown rots to become exposed to air through dislodging of soil and mulch.
3. Maintain originally called for depth of mulch to reduce evaporation and frequency of watering.

B. Re-setting: Reset plants to proper grades and upright position.

C. Weed Control:

1. All areas between plants, including watering basins, shall be weed free at all times.
2. Use only recommended and legally approved herbicides to control weed growth.
3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

D. Pruning:

1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of 18" to 48" and radial orientation so as not to overlay one another.
2. Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Reduce topping and wind damage by thinning out crowns.
3. Prune trees to maintain growth within space limitation, maintaining a natural appearance and balancing crown with roots.

4. No stripping of lower branches ("raising up") of young trees will be permitted.

5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.

6. Thin out and shape evergreen trees when necessary to prevent wind and storm damage.

7. Do primary pruning of trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.

8. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.

9. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1" diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.

10. Branches too heavy to handle shall be pre-cut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18" or more from the trunk to removed the branch. Make the third cut at the trunk to remove the resulting stub.

11. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.

12. Clip shrubs to be hedged when branches project 2" beyond limit of clipped hedge shown on the drawings.

13. Take extreme care to avoid transmitting disease from one infected plants to another. Properly sterilize pruning tools before going from one infected plant to all other plants.

E. Staking and Guying of Trees:

1. Inspect stakes and guys at least once a month to check for rubbing that causes bark wounds.

2. Repair and replace staking and guying as shown in the drawings, and as specified.

F. Maintenance of Existing Plantings to Remain:

1. Generals: Conform to all applicable paragraphs regarding pruning, watering, spraying, and fertilizing of new plant materials as specified in this section.

2. Symptoms: Be alert to symptoms of construction damage to existing plantings as evidenced by wilting, unseasonal or early flowering or loss of leaves, and insect or disease infestation due to declining vigor.

3. Notification: Submit in writing of evidences of declining vigor immediately upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified in this section.

4. Proposal: Submit written proposal and cost estimate for the correction of all conditions before proceeding with permanent correction work.

3.4. GROUNDCOVERS

A. Watering:

1. Check for moisture penetration throughout the root zone at least twice a month.

2. Water as frequently as necessary to maintain healthy growth of plants.
B. Weed Control:
   1. Control weeds, preferably with pre-emergent herbicides and with selective systemic herbicides.
   2. Minimize hoeing of weeds in order to avoid plant damage.

C. Fertilization:
   1. Recently installed plant materials: Verify with Owner actual completion date of planting installation and rate of prior application of fertilizers.
   2. New plant materials: Place one (1) 5-gram tablet (20-10-5; N-P-K) beside the root ball about an inch from root tips.
   3. Established plant materials: Do not use complete fertilizers unless soil test shows specific nutrient deficiencies.

D. Mowing and Edging:
   1. Trim edge of groundcovers to keep in bounds of planting beds.
   2. Trip top growth of groundcovers as necessary to achieve an overall even appearance.
   3. Groundcovers which lend to mowing shall be mowed to specified height above finished grade in order to renew growth, improve density and attractiveness.

E. Replacements:
   1. Replace dead and missing plants after obtaining Owner's agreement to pay for replacement, and if not covered under Special Warranty by the installation contractor.
   2. Damages due to Contractor's negligence shall be paid for without charge to Owner.

3.5. ANNUALS AND PERENNIALS

A. Watering:
   1. Hand-water all pre-cast pots and planters without an automatic irrigation system.
   2. Species, sizes of plants, container sizes and orientation shall dictate frequency of watering. Submit to Owner a watering schedule for different seasonal requirements.

B. Weed control: All planters and planting beds with annuals and perennials shall be weed-free at all times.

C. Pruning:
   1. Limit pruning to removal of damaged or dead twigs and foliage.
   2. Remove spent flowers on a weekly basis.
   3. Perennial foliage and ornamental grasses shall remain in place through winter and cut back by the end of March.

D. Replacement:
   1. Replace annuals when materials exhibit a "spent" condition.
   2. Thoroughly cultivate soil after removal of "spent" or dead plants prior to planting new materials.

E. Fertilization: Incorporate slow release fertilizers into the planting soil per manufacturer's current specifications, and rake smooth prior to planting.
3.6. TURF

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf.
   1. Maintenance contractor's foreman should be familiar with the Maintenance Manual's requirements.
   2. Fill in as necessary soil subsidence that may occur because of settling, rutting, or other processes. Replace materials and turf damaged or lost in disturbed areas.
   3. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

B. Watering: Install and maintain temporary above surface piping, hoses, and turf-watering equipment to convey water from sources.
   1. Water at such frequency as weather conditions require, to keep turf uniformly moist to a depth of 4 inches during establishment.
   2. Once turf is established, water lawn at a minimum rate of 1 inch per week or as required to maintain proper soil moisture.
   3. Water turf with combination of temporary overhead watering systems or tools.
   4. Keep temporary watering system equipment off walkways and sport courts.
   5. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
   6. Watering shall be done during early mornings.

C. Weed Control
   1. Control broadleaf weeds with selective herbicides.
   2. In areas where crabgrass has infested the lawn, apply a selective post-emergent herbicide as soon as possible, and prior to flowering.
   3. Apply pre-emergent herbicides such as Dacthal, Balan, or Betasan prior to crabgrass germination.
   4. Do not irrigate for 48 hours after application of herbicidal sprays.
   5. Coordinate application of herbicides with thatch control and reseeding schedule as described below.

D. Mowing and Edging:
   1. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height in initial mowing and 40% in all subsequent mowings.
   2. Do not delay mowing until grass blades bend over and become matted.
   3. Do not mow when grass is wet.
   4. Schedule mowings to maintain the following minimum grass height: 3 inches.
   5. Trim edges at least twice a month or as needed for neat appearance. Vacuum clippings.

E. Reseeding of Lawn Areas: Match existing seed mix of adjacent areas.

F. Renovating of Existing Lawns:
   1. Thatch Control: Maintain thatch layer at 1/2 in. depth or less. Verticut as required.
a. Three weeks before verticutting lawn, apply nitrate fertilizers.
b. Perform verticutting operations preferably in the Fall, but otherwise in the Spring. Remove all debris from verticutting. Overseed as needed.
c. Overseeding must not be followed by application of pre-emergent herbicides for at least four to six weeks. Normally this means that lawns invaded by weeds shall be renovated and overseeded in the Fall, and treated for weed control in the following late winter.

2. Aeration:
   a. Do not perform aeration work during season of active weed germination.
   b. Verify compacted areas to improve water penetration when needed, using a piston-driven aerifier with hollow tines. Rake up and removed all resulting soil cores. Fertilize and irrigate immediately after clean up of cores.

G. Fertilizers:
   1. Recently seeded and sodded lawn areas: Verify with Owner previous applications of fertilizer(s).
   2. Established lawn areas: apply a slow release (3 to 5 months) fertilizer (12-8-8; N-P-K) once in spring and again in the fall at the following rates:

<table>
<thead>
<tr>
<th>Program</th>
<th>100 sq. ft.</th>
<th>Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum</td>
<td>15 lbs.</td>
<td>650 lbs.</td>
</tr>
<tr>
<td>Medium</td>
<td>12 lbs.</td>
<td>500 lbs.</td>
</tr>
<tr>
<td>Low</td>
<td>8 lbs.</td>
<td>350 lbs.</td>
</tr>
</tbody>
</table>

3. Apply fertilizer when grass is dry and preferably after mowing. Do not apply during hot weather or when grass is under stress. Water immediately after application.
4. Apply only nitrogen unless a soil test shows a specific nutrient deficiency.
5. If soil pH gets below 6.0, then a basic fertilizer such as calcium nitrate may be preferable to an acidic fertilizer. Follow the soil chemist's recommendation when deficiencies appear.

3.7. INSECTS, PESTS, AND DISEASE CONTROL

A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:
   1. Presence of insects, moles, gophers, ground squirrels, snails, and slugs in planting areas.
   2. Discolored or blotching leaves or needles.
   3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.

B. Personnel: Only licensed, qualified, trained personnel shall perform spraying for insect, pest and disease control.

C. Application: Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.

3.8. TERMINATION OF THE MAINTENANCE PERIOD

A. Final Acceptance Procedure
   1. Work will be accepted by the Owner and Landscape Architect upon satisfactory completion of all work including maintenance period's corrective or replacement work under the Warranty Period.
2. Submit a written request to Landscape Architect for review for Final Acceptance at least fifteen (15) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.

B. Corrective Work:

1. Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.

2. Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.

3. After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance is received in writing.

C. Conditions for Acceptance of Work at End of Maintenance Period:

1. Each plant and all lawn areas shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.

2. Replace all plants and correct all turf areas not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such plants and turf areas.

D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

3.9. CLEANING

A. Dispose of all pruned materials, vacuum all lawn clipping and leaves, sweep all walkways and rake smooth all mulched areas.

B. Collect and remove all trash that has blown onto the site.

C. Remove from the site all containers and evidence of maintenance activities.

3.10. CLOSE OUT

A. Landscape Maintenance Record: Submit binder to Owner with all documentation and records required and utilized during the maintenance period.

B. Keys and Identification: Return all keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION 32 9447
SECTION 33 0513 - MANHOLES AND STRUCTURES

PART 1  GENERAL

1.1.  SECTION INCLUDES

A. Modular precast concrete manhole sections with tongue-and-groove joints covers, anchorage, and accessories.

1.2.  REFERENCE STANDARDS


B. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections (Metric); 2015a.


1.3.  SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

C. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.

PART 2  PRODUCTS

2.1.  MATERIALS


PART 3  EXECUTION

3.1.  MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Cut and fit for pipe.

D. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

E. Coordinate with other sections of work to provide correct size, shape, and location.

END OF SECTION 33 0513
SECTION 33 1416 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines.

1.2. RELATED REQUIREMENTS

A. Section 31 2316 - Excavation: Excavating of trenches.

B. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 31 2323 - Fill: Bedding and backfilling.

1.3. REFERENCE STANDARDS

A. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.

B. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2017.

1.4. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.1. WATER PIPE

A. PVC Pipe: AWWA C900 Class 100:

B. Polyethylene Pipe: AWWA C901:

C. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.2. VALVES

PART 3 EXECUTION

3.1. PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.
C. Prepare pipe connections to equipment with flanges or unions.

3.2. TRENCHING

A. See the sections on excavation and fill for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.3. INSTALLATION - PIPE

A. Route pipe in straight line.

B. Install pipe to allow for expansion and contraction without stressing pipe or joints.

C. Slope water pipe and position drains at low points.

END OF SECTION 33 1416
SECTION 33 3113 - SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1  GENERAL

1.1. SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to on site sewer system.

1.2. RELATED REQUIREMENTS

A. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

B. Section 31 2323 - Fill: Bedding and backfilling.

1.3. DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4. REFERENCE STANDARDS


1.5. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Field Quality Control Submittals: Document results of field quality control testing.

E. Project Record Documents:
   1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

PART 2  PRODUCTS

2.1. SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Plastic Pipe: ASTM D2729, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter as indicated on the plans, bell and spigot style solvent sealed joint end.

C. Plastic Pipe: ASTM D3350, SDR 11, High Density Polyethylene (HDPE) material; inside nominal diameter as indicated on plans, with cell classification of 335434C or better, thermal butt fusion joints and fittings in accordance with manufacturer's recommendations; pipe and fittings same material utilizing transition fittings when connecting to existing piping.
D. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.2. PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.3. BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 2323.

B. Pipe Cover Material: As specified in Section 31 2323.

PART 3 EXECUTION

3.1. GENERAL

A. Perform work in accordance with applicable code(s).

3.2. TRENCHING

A. See Section 31 2316.13 for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.3. INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.

1. Plastic Pipe: Also comply with ASTM D2321.

B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

C. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.

D. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

3.4. PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 3113
SECTION 33 4211 - STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.
B. Connection of drainage system to municipal sewers.
C. Catch basins, Trench drains, Plant area drains, Paved area drainage, Site surface drainage, Detention tank, and Detention basin.

1.2. RELATED REQUIREMENTS

A. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
B. Section 31 2323 - Fill: Bedding and backfilling.

1.3. DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4. REFERENCE STANDARDS


1.5. SUBMITTALS

A. See Section 01 3300 - Submittals, for submittal procedures.
B. Product Data: Provide data indicating pipe, pipe accessories.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Project Record Documents:
1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.

1.6. REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.1. SEWER PIPE MATERIALS


B. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class II with Wall type A; mesh reinforcement; inside nominal diameter as indicated on plans, bell and spigot end joints.

C. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

D. Plastic Pipe: ASTM D2729, Poly Vinyl Chloride (PVC) material; inside nominal diameter as indicated on plans, bell and spigot style solvent sealed joint end.

2.2. PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service" in large letters.

C. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.

2.3. BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2323.

B. Cover: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.1. TRENCHING

A. See Section 31 2316.13 - Trenching for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.2. INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.
B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

C. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

D. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

END OF SECTION 33 4211