

PROJECT MANUAL
for
BROADWAY FIELD RENOVATION

SEASIDE SCHOOL DISTRICT
2600 SPRUCE DR, STE. 100
SEASIDE, OR 97138

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DOCUMENT 000107 – SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:

1. Jacob E. Zander, AIA



2. 12412
3. Responsible for Divisions 00-02 and 06-11

B. Civil Engineer:

1. Zachary A. Stokes, PE



2. 81129PE
3. Responsible for Divisions 31-33

C. Structural Engineer:

1. Matthew R. Smith, PE, SE



2. 07888PE
3. Responsible for Divisions 03-05

D. Plumbing and HVAC Engineer:

1. Charles White



2. 98864 PE
3. Responsible for Divisions 22-23

E. Electrical Engineer:

1. Cody Cowdin



EXPIRES: 12/31/2023

2. 99536PE
3. Responsible for Divisions 26-27

END OF DOCUMENT 000107

DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. Soil-boring data for Project, obtained by NV5, dated 04-12-23, is available for viewing at the office of Construction Manager.
- D. A geotechnical investigation report for Project, prepared by NV5, dated 04-12-23, is available for viewing at the office of Construction Manager.
 - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
 - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF DOCUMENT 003132

SECTION 011000 – SUMMARY

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. General requirements.
- B. Work covered by Contract Documents.
- C. Standard working hours/days.
- D. Delegated design requirements.
- E. Contractor use of premises.
- F. Asbestos survey and abatement, where occurs.
- G. Related work by Owner or others.
- H. Owner furnished products.

1.2 GENERAL REQUIREMENTS

- A. Time of Completion:
 - 1. The work of this Contract shall commence on the date of written Notice to Proceed and shall be complete by the dates established in the Owner-Contractor Agreement, and as stipulated in the General Conditions of the Contract for Construction.
- B. Asbestos-Free Certification:
 - 1. Absolutely no materials containing asbestos are to be furnished or installed or re-installed as part of this Project. Ensure that subcontractors and the Contractor's own work forces do not install materials containing asbestos. At final closeout of the Project, provide Owner certification that no materials containing asbestos have been installed in the Project and, the Project is asbestos-free as required by the State of Oregon.
- C. Coordination:
 - 1. The Contractor is responsible for overall coordination of the Project.
 - 2. The Drawings and Specifications are arranged for convenience only and do not determine which trades perform the various portions of the Work.
 - 3. Structural Specifications are embedded within drawings, coordinate with the Project and Work.
 - 4. Coordinate sequence of work to accommodate agreed-upon Owner occupancy.
 - 5. Perform necessary work to receive and/or join the work of all trades.
 - 6. Verify location of existing utilities and equipment and protect from damage.

D. Permits and Fees:

1. The Owner is responsible for filing and paying for building permits and fees associated with the building permit and system development charges.

E. The Contractor is responsible for obtaining all Project construction permits and will have full responsibility for requirements of and payments for all trade permits (i.e. electrical, plumbing, mechanical) and all costs associated with deferred submittals. Requirements for Contractor, subcontractors, and material suppliers include:

1. Ensure that persons performing the Work comply with Owner's tobacco policy. Copies made available upon request.
2. Subcontractors shall refrain from contact with staff and students at all times.
3. Neither the Contractor nor its subcontractors of any tier shall utilize any employee at the site who has pled guilty to or been convicted of any felony crime involving the physical neglect of a child, physical injury to or death of a child, sexual offenses against or sexual exploitation of a child, child prostitution, or other similar offenses as defined by the most current State Statutes, or similar laws of another jurisdiction. Remove from the work and work site any employee who has engaged in such actions, or who the Owner reasonable considers objectionable.
4. Without limiting the generality of the foregoing, ensure by appropriate provision in each subcontract agreement that the Contractor may remove from the work and work site any subcontractor or subcontractor's employee who has engaged in such action. At no change to the Contract Sum or Contract Time, remove from the work and work site any employee or other person pursuant to this Section. Failure to comply with these requirements is grounds for immediate termination of the Agreement for cause.
5. Subcontractors and material suppliers shall be responsible for additional requirements as indicated in the Owner-Contractor Agreement.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of this Contract, referred to as Project and Work where occurs in the specifications, comprises of renovation and additions at the Nestucca Valley K-8 school, as indicated on the drawings.

1.4 STANDARD WORKING HOURS/DAYS

- A. Project schedule assumes a five (5) day work week unless noted in the project contract schedule.
- B. Exterior work may be performed Monday through Friday from 7:00 a.m. through 6:00 p.m. and Saturday from 8:00 a.m. through 4:00 p.m.
- C. Interior work that does not generate noise may be performed Monday through Friday from 7:00 a.m. through 11:00 p.m. and Saturday from 7:00 a.m. through 5:00 pm with the concurrence of the District Authorized Representative.

- D. For any deviation from the above stated working days/times, submit a request in writing to the District at least 48 hours prior to the date in question. While the District cannot assure approval in every instance, efforts will be made to accommodate such requests.

1.5 DELEGATED DESIGN REQUIREMENTS

- A. Certain components of the Work under this project are Delegated Design. It is the Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibilities for the design, calculation, submittals, fabrication, transportation and installation of the Delegated Design portions or components as required. Delegated Design components of the Work are defined as complete operational systems, provided for their intended use.
- B. Submit deferred submittals for delegated design elements to the governing agency for the separate approval of each Delegated Design item as defined in Section 013000 "Administrative Requirements".
- C. Owner shall not be responsible to pay for delays, additional products, additional hours of work or overtime, restocking or rework required due to failure by the Contractor or subcontractors to coordinate their work with the work of other trades on the Project or to provide the Delegated Design portion or component in a timely manner to meet the schedule of the Project.
- D. Delegated Design components include, but are not limited to the following:
 - 1. Where Work Occurs:
 - a. Seismic anchorage for the building structure and seismic restraints for systems in Divisions 22, 23, 26, 27 and 28.

1.6 CONTRACTOR USE OF PREMISES

- A. Work Sequence:
 - 1. Perform Work in a manner required to accommodate School District use of premises during the Contract Period. Coordinate Work schedules and operations with Owner's use requirements.
 - 2. Provide access to and from site as required by law and by Owner:
 - a. Emergency Building Exits During Construction: Keep exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 3. Do not obstruct roadways, sidewalks, or other public ways without permit.
 - 4. Keep building exits safe, protected, and restricted from remainder of construction site and clear of obstructions at all times.

B. Limitations on Use:

1. Complete and exclusive use of the construction area except will be permitted from Notice to Proceed until Substantial Completion.
2. Smoking or open fires are not permitted within the building enclosure or on the Project site.
3. Do not encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated or coordinated with Owner.
4. Move stored products under Contractor's control that interfere with operations of Owner or separate contractors.

C. Contractor's Site Conduct:

1. Identifying photo name tags shall be worn at all times by Project site workers.
2. No loitering in the school buildings or unsupervised/unauthorized entry.
3. Site is tobacco- and cannabis-free. This means no smoking or chewing on school property.
4. Beyond courtesy, there should be no interaction between staff and faculty.
5. Keep project free of pop cans, lunch wrappers and similar debris.
6. Review with the Owner the scheduling of work that is excessively noisy or has the potential to disrupt activities of Owner or neighbors.
7. Be considerate of the client, the students and faculty.
8. Always consider, prior to an act, the safety of students, faculty, and other co-workers.
9. Profanity is not acceptable.
10. The wearing of clothing with logos displaying alcohol, tobacco, illegal or restricted substances or suggestive themes is not acceptable attire.

D. Non-Interference with Serving Utilities:

1. Consult with public and private utility companies for location and extent of utilities before commencing work.
2. Provide services of a utilities locator to investigate and mark underground utilities in the vicinity of exterior work; and for interior below-slab utilities in areas that will be partially demolished prior to commencing work. Ensure that utilities are identified prior to saw cutting interior floor slabs.
3. Provide all services required. Protect and maintain existing utilities, active electrical conductors, sewers, pipes, and other active lines either on Project site or in offsite street excavations.
4. Arrange for and pay cost of disconnecting, removing, relocating, capping, replacing, or abandoning of public and private utilities in the way of construction operations in accordance with serving utilities policies, local regulations and governing codes. Utilities, pipes, sewers, electrical conductors and the like to be abandoned shall be capped in accordance with instructions of governing authority or as directed.

E. Protections - Exterior Work, as Applicable:

1. Protect sidewalks, asphalt paving, concrete, plantings, and lawn areas from spillage of materials used in carrying out the Work. Exercise care to preclude materials from clogging catch basins and yard drains. Leave drainage items clean and in proper working condition.
2. Clean, repair, resurface, or restore existing surfaces to their original condition, or completely replace such surfaces to match existing where damaged by construction operations.
3. Whenever it is necessary to cut and remove fences and/or power lines (whether on private or public property), restore such demolished work to condition at minimum equal to that which existed prior to such demolition.
4. Restore damage to property adjacent to Owner's property to the satisfaction of respective property owners.

F. Protections - Interior Work, as Applicable:

1. Contractor is responsible for protection of completed portions of the Work. Provide protection as required such that items are not soiled or damaged during the progression of the Work. Maintain such protections for duration of construction until acceptance by Owner.
 - a. Provide a weathertight condition throughout the Work. Clean, repair, resurface or restore building and site components required to be protected to their original condition, or completely replace items to match existing undamaged portions of Work, where damaged by construction operations.
2. Whenever it is required and/or necessary to demolish portions of Work, take precautions to protect adjacent portions of the Work that remain from damage.
3. Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish or construction debris.

G. Protections: Vegetation and Plantings, where applicable:

1. Protect existing trees to remain on-site from foliage, trunk, branch, and root damage.
2. Provide barricades and maintain same around trees, plantings, and other landscaped areas adjacent to Work of this Contract to protect such areas from damage caused by construction operations.
3. Replace plantings damaged or destroyed with plants of equivalent type, size, quantity, and nature as approved by Architect.

H. Security:

1. Provide security and facilities to protect the Work and Owner's operations from unauthorized entry, vandalism, and theft.
2. Provide temporary barriers, doors, and locks at openings.
3. Lock automotive vehicles and other mechanized or motorized construction equipment when parked and unattended. Do not leave vehicles or equipment unattended with the motor running or ignition key in place.
4. Coordinate with Owner's building security provider and program.

- I. Removal of Equipment and Materials:
 - 1. Clear site and surrounding street areas of equipment, apparatus, appliances, tools, unused materials, and similar items immediately as they cease to be necessary to carry out the Work.

- 1.7 ASBESTOS SURVEY AND ABATEMENT
 - A. All work to align with Owner Environmental Remediation Plan.
 - B. Additional cost for abatement of asbestos discovered during course of construction work shall be brought to the attention of the Owner and fully agreed upon prior to commencing abatement work.

- 1.8 RELATED WORK BY OWNER OR OTHERS
 - A. NIC and OFOI Items: Items designated on the Drawings and/or described in the Project Manual as "NIC" (Not In Contract) or "OFOI" (Owner Furnished, Owner Installed) are not included in the Contract.

- 1.9 OWNER-FURNISHED PRODUCTS
 - A. OFCI Equipment and Products: Items specifically designated on Drawings or specified in the Project Manual and/or described as "OFCI" (Owner Furnished, Contractor Installed).
 - B. Owner's Responsibilities for OFCI Products:
 - 1. Arrange for delivery of shop drawings, product data, samples, manufacturer instructions, and certificates to Contractor.
 - 2. Deliver supplier's bill of materials to Architect for review.
 - 3. Arrange and pay for delivery to site in accordance with Contractor's Progress Schedule.
 - 4. Inspect deliveries jointly with Contractor.
 - 5. Submit claims for transportation damage.
 - 6. Arrange for replacement of damaged, defective, or missing items.
 - 7. Arrange for manufacturer's field services; arrange for and deliver manufacturer warranties and bonds to Contractor.
 - C. Contractor Responsibilities for OFCI Products:
 - 1. Designate submittals and delivery date for each product in project Progress Schedule.
 - 2. Review shop drawings, product data, samples, and other submittals. Submit to Architect with notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - 3. Receive and unload products at work site.
 - a. Inspect deliveries jointly with Owner, record shortages and damaged or defective items.
 - b. Handle products at site including uncrating and storage.
 - c. Protect products from damage and from exposure to elements.
 - d. Assemble, install, connect, adjust, and finish products.

- e. Provide installation inspections required by public authorities and jurisdictions.
- f. Repair or replace items damaged by Contractor to satisfaction of Owner.

D. Schedule of OFCI Products and Equipment: As indicated on Drawings as OFCI.

- 1. Where required for installation, coordinate placement of accessories to meet accessibility requirements, clearance from grab bars and placement of backing.

PART 2 -

PRODUCTS

NOT USED

PART 3 -

EXECUTION

NOT USED

END OF SECTION 011000

SECTION 012500 - PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for the Work in relation to substitutions and product options.

1.2 SUBSTITUTION PROCEDURES

- A. Substitution requests will not be considered prior to receipt of Bids unless the Architect receives a written request for approval at least seven days prior to the date for receipt of Bids. Comply with requirements specified in this Section. Requests received after that time will not be considered except as specified below under "Substitutions Requested After Award of Contract."
- B. Submit requests for substitution electronically as PDFs.
 - 1. Submit requests for substitution during the Bid Phase via email to the individual indicated in Instructions to Bidders.
 - 2. Submit requests for substitution after the Bid Phase through the Contractor. Substitution requests received directly from subcontractors or suppliers will be returned through the Contractor without review.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- D. A request for substitution constitutes a representation that the Contractor/Bidder:
 - 1. Has investigated proposed product and determined that it is equal to or superior in all respects to specified product.
 - 2. Will provide identical warranty as required for the specified product.
 - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Will pay for changes to building design, including architectural or engineering design, detailing, construction costs, or re-approval by authorities caused by the requested substitution.
- E. Substitutions after Award of Contract will not be considered when:
 - 1. Indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
 - 2. Submittal for substitution request has not been reviewed and recommended by Contractor. Substitution requests received directly from subcontractors or suppliers will be returned through the Contractor without review.
 - 3. Acceptance will require substantial revision of Contract Documents or other items of

- the Work.
4. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.
- F. Substitution Request Forms: Appended to This Section.
1. Prior to bidding: Substitution Request Form, For Substitution Requests Prior to Bidding.
 2. After the Bidding Phase: Substitution Request Form, For Substitution Requests During Construction Administration Phase (post-bid).
- G. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
1. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 2. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 5. Samples, where applicable or requested.
 6. Certificates and qualification data, where applicable or requested.
 7. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 8. List of availability of maintenance services and replacement materials.
 9. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 10. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 11. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 12. Cost information, including a proposal of change, if any, in the Contract Sum.
 13. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 14. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- H. Accepted Substitutions prior to Bid Date will be listed in Addenda published in accordance with Advertisement for Bids and the Instructions to Bidders. Bidders will not rely upon approvals made in any other manner.

- I. Architect's Action for Substitutions After Award of Contract: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 1. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 2. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.3 SUBSTITUTIONS REQUESTED AFTER AWARD OF CONTRACT

- A. Substitutions will normally not be considered after date listed in Instructions to Bidders, except when required due to unforeseen circumstances. Within a period of 15 days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified when submitted in accord with the requirements stipulated herein. To receive consideration, one or more of the following conditions must be documented in any such request:
 1. The substitution is required for compliance with final interpretation of Code requirements or insurance regulations.
 2. The substitution is required due to unavailability of a specified product, through no fault of the Contractor.
 3. The substitution is required because subsequent information disclosed the inability of the specified product to perform properly or to fit in the designated space.
 4. Manufacturer's or fabricator's refusal to certify or warrant performance of specified product as required.
 5. Subsequent information that a long delivery date will not be compatible with the Contract construction period.
 6. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- B. District reserves the right to reject any and all substitution requests for any reason, without obligation or liability.

PART 2- PRODUCTS
NOT USED

PART 3 – EXECUTION
NOT USED

END OF SECTION 012500

SECTION 012500.01 – SUBSTITUTION REQUEST FORM, BID PHASE

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

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

The undersigned states that the following paragraphs, unless modified on attachments, are ALL correct:

1. THE PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.
2. THE UNDERSIGNED WILL PAY FOR CHANGES TO THE BUILDING DESIGN, INCLUDING ENGINEERING DESIGN, DETAILING AND CONSTRUCTION COSTS CAUSED BY THE REQUESTED SUBSTITUTION.
3. THE PROPOSED SUBSTITUTION WILL HAVE NO ADVERSE EFFECT ON OTHER TRADES, THE CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.
4. MAINTENANCE AND SERVICE PARTS WILL BE LOCALLY AVAILABLE FOR THE PROPOSED SUBSTITUTION.

The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

For use by Design Consultant:

Signature _____

Firm _____

Address: _____

Date: _____

Telephone: _____

Attachments: _____

- | | |
|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> |
| Accepted | Accepted as noted |
| <input type="checkbox"/> | <input type="checkbox"/> |
| Not Accepted | Received too late |

By: _____

Date: _____

Remarks: _____

SECTION 012500.01 – SUBSTITUTION REQUEST FORM, CA PHASE

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

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

Substitutions for After Bidding: The undersigned states that the substitution is requested DUE TO AT LEAST ONE of the following conditions (indicate and substantiate condition in attachments; failure to identify one of these conditions will result in rejection of the substitution):

1. SPECIFIED PRODUCT IS NO LONGER AVAILABLE.
2. SPECIFIED PRODUCT IS NO LONGER COMPATIBLE, DUE TO CHANGES IN THE DESIGN DURING CONSTRUCTION.
3. A CHANGE IN GOVERNING REGULATORY REQUIREMENTS MAKES A REVISION IN DESIGN OR MATERIAL USAGE MANDATORY.
4. SUBSTITUTION OFFERS THE OWNER A SUBSTANTIAL ADVANTAGE IN COST, TIME, ENERGY CONSERVATION, OR OTHER CONSIDERATIONS (Provide substantiation for review).

The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

For use by Design Consultant:

Signature _____

Firm _____

Address: _____

Date: _____

Telephone: _____

Attachments: _____

- | | |
|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> |
| Accepted | Accepted as noted |
| <input type="checkbox"/> | <input type="checkbox"/> |
| Not Accepted | Received too late |

By: _____

Date: _____

Remarks: _____

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedures for processing contract modifications and Change Orders.

1.2 RELATED REQUIREMENTS

- A. Owner-Contractor Agreement: Governing requirements for changes in the Work, in Contract Cost, and Contract Time.
- B. Section 013000 "Administrative Requirements" for submittal procedures.
- C. Section 017800 "Closeout Submittals" for Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.3 SUBMITTALS

- A. Submit name of individual authorized to accept changes, and to be responsible for informing others in Contractor's employ of changes in the Work.

1.4 GENERAL REQUIREMENTS

- A. Additional work shall not be undertaken without Owner's written approval.
- B. Written approval authorizing Contractor to undertake additional Work does not authorize automatic extension of Contract Completion time.

1.5 DEFINITIONS

- A. Change Order (CO): This document executed by Owner, Contractor and Architect formally changes the Contract Sum, Contract Scope or Contract Time and incorporates Change Requests and/or Construction Change Directives.
- B. Change Request (CR): This document initiated by the Owner or Contractor is to be priced by the Contractor. Upon authorization by the Owner it becomes an instruction to the Contractor to modify the scope of the Contract for inclusion in a future Change Order.
- C. Architect's Supplemental Instructions (ASI): This form is a written order comprising instructions or interpretations, signed by Architect making minor changes in the Work not involving a change in Contract Sum or Contract Time. If the Contractor considers that the ASI constitutes a Change in the Work, it must notify the Owner in accordance with the Contract Documents.

- D. Construction Change Directive (CCD): A written order to the Contractor, by the Owner, amending Contract Documents as described. This order directs Contractor to proceed with Work that may alter Contract Sum and/or Contract Time, and is intended to be included in a subsequent Change Request pending agreement on changes in the Contract Sum and/or Contract Time. The Owner will include a not-to-exceed value for the proposed CR process in the CCD.

1.6 SIGNATURES

- A. All signatures on Change Orders and Construction Change Directives shall be original or scanned signatures. Electronically inserted signatures, electronically stamped signatures and digital signatures are not acceptable. Scanned copies of signatures are acceptable but the scan must be legible.

1.7 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
 - 1. Form for Minor Changes in the Work: Architect's "Architect's Supplemental Instructions" form.
 - 2. If Contractor determines that an Architect's Supplemental Instruction involves adjustments to the Contract Sum or Contract Time, Contractor shall prepare and issue a Change Request to the Architect and Owner for approval prior to proceeding with the Architect's Supplemental Instruction.

1.8 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

- A. Maintain detailed records of work performed on a time and materials basis. Provide complete information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
- D. Provide additional data to support computations including:
 - 1. Quantities of products, labor, and equipment.
 - 2. Taxes, insurance, and bonds.
 - 3. Overhead and profit.
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.

- E. Support each claim for additional costs, and for work performed on a time and materials basis with the following information:
1. Origin and date of claim.
 2. Dates and times work was performed, and by whom.
 3. Time records and wage rates paid.
 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 5. Follow all other requirements indicated in the Owner-Contractor Agreement.

1.9 PROPOSED CHANGE PROCEDURES

- A. For changes for which advance pricing is desired, Owner will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications. Contractor shall prepare and submit a fixed price quotation within 14 days.
1. Form for Change Requests: Contractor's standard.
 2. Form for Fixed Price Quotation: Electronically submitted PDF to Contractor.
- B. If latent or unforeseen condition require modifications to the Contract, or if an RFI response or an Architect's Supplemental Instruction is determined to have cost or schedule impacts, Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 012500 "Product Substitution Procedures".
1. Form for Proposal Requests: Contractor's standard.
 2. Form for Fixed Price Quotation: Electronically submitted PDF.
- C. Change Request Log: Log will be maintained by Contractor.

1.10 APPROVAL OR REJECTION OF CHANGE REQUEST

- A. When a proposed change is initiated through a Change Request:
1. Submit the following in writing within seven (7) days of date on Proposal Request:
 - a. All allowable direct and indirect costs.
 - b. Schedule of Values and Unit Prices including basis for costs.
 - c. Quotation will be guaranteed for period specified in the CR beginning from signing of proposal, but, as a minimum, 30 days. If no period is specified, quotation shall be guaranteed for 60 days from signing.
 - d. Proposal shall be approved by authorized person.
 - e. Failure of the Contractor to respond with pricing in a timely manner shall not be justification for claims by the Contractor of delay of the project associated with the Change.

2. Architect and Owner will review proposal and respond in writing by one of the following:
 - a. Authorizing.
 - b. Requesting additional information.
 - c. Rejecting.
3. Authorization to proceed with Change: Owner to provide written authorization to the Contractor to undertake Work.

B. When Change is initiated by Contractor: Submit to Owner.

1. Architect and Owner review and respond in writing by one of the following:
 - a. Processing a Change Order or Proposal.
 - b. Requesting additional information.
 - c. Rejecting.
2. If Owner responds by processing a Change Request, follow procedure outlined above.
3. If additional information is requested by Owner, respond in writing within seven (7) days of Owner's request.

1.11 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each lump sum proposal quotation and each unit price (not previously established) with detailed substantiating data. Clearly cross reference tracking numbers of CCDs, RFIs, CRs, etc. to allow easy identification of costs origins.
 1. Include as separate line items any changes related to credits to Contract Sum or Contract Time associated with not performing the originally specified Work.
- B. On request, provide additional data to support time and cost computations:
 1. Labor hours, number of workers, time cards and hourly rate cost justification
 2. Equipment hours, make and model, number of pieces required, rental agreements and hourly rate justification.
 3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 4. Documented credit for Work deleted from Contract.
 5. Justification citing specifics of critical path impacts per current CPM for any change in Contract Time.
- C. Support each claim for additional costs, and time-and-material/force account work with documentation, as required for lump-sum proposal. Include additional information:
 1. Name of Owner's authorized agent who ordered work, and date of order.
 2. Dates and times work was performed and by whom.

3. Time record, summary of hours worked and wage rates paid.
4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.

1.12 CONSTRUCTION CHANGE DIRECTIVES

- A. For changes that involve an adjustment to the Contract Sum or Contract Time, Owner will issue a document instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
 3. Form for Construction Change Directives: Architect's "Construction Change Directive" form.

1.13 FIXED PRICE CHANGE ORDER

- A. Change Order shall upon Owner's Change Request and Contractor's fixed price quotation; or Contractor's request for Change Order as approved by Owner.
- B. Change Order describes Work changes, additions and deletions, with attachments of authorized Proposal Requests, agreed Construction Change Directives and/or previously agreed upon change pricing or Contract Time modifications.
- C. Change Order shall provide accounting of any Contract Sum and Contract Time adjustment.

1.14 UNIT PRICE CHANGE ORDER

- A. For pre-determined unit prices and quantities, Change Order will be executed on a fixed price basis.
- B. For unit costs or quantities of units of work which are not predetermined, execute Work under a Construction Change Directive. Changes in Contract Sum or Contract Time will be computed as specified for a time and material Change Order.

1.15 TIME AND MATERIAL NOT-TO-EXCEED CHANGE REQUEST

- A. Submit itemized account and supporting data daily during the course of the Work.
- B. Owner will determine the change allowable in Contract Sum and Contract Time as provided in the General Conditions of the Contract.

- C. Maintain and provide detailed records of work done on a time and materials basis and submit verified records at the end of each day to the Owner for review and acceptance.

1.16 EXECUTION OF CHANGE ORDERS

- A. Change Orders will be issued for approval of parties as provided in General Conditions.
 - 1. Form for Change Orders: "Change Order" form.
- B. Fully executed forms for CCDs or Change Requests authorize Contractor to proceed with Change.
- C. Promptly sign and date Change Order or provide detailed written and signed statement detailing reasons if refusing to sign. If the Contractor does not sign and return the Change Order, all aspects will be considered disputed, and Contractor shall not be paid on any Work on it.

1.17 DISTRIBUTION

- A. Owner will distribute one electronic copy to Architect and Contractor for review.
- B. Change Orders: Upon authorization, all parties will sign originals with original or original scanned signatures.
 - 1. Project procedures for distribution will be discussed and agreed upon at the preconstruction meeting.
 - 2. All parties will receive fully executed digital copies of the Change Order for record.
- C. Construction Change Directives: Upon authorization, Owner will initiate CCD process which will include acceptance steps by Architect and Contractor.
 - 1. Directive describes Work Change additions or deletions, with attachments of revised Contract Documents.

1.18 CREDIT AMOUNT TO CONTRACT SUM - INSURANCE

- A. If a Change Order or Construction Change Directive results in a reduction of the Contract Sum, the Owner shall be entitled to a credit that includes the amount of the value of bond premium and amounts charged for additives for insurance premium and any other allowable markups.

1.19 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item. Adjust Contract Sum as shown on Change Order.
- B. Promptly revise Progress Schedule to reflect any changes in Contract Time, revise subschedules to adjust times for other items of work affected by the change, and resubmit.
- C. Promptly enter changes in Project Record Documents.

PART 2 -

PRODUCTS

NOT USED

PART 3 -

EXECUTION

NOT USED

END OF SECTION 012600

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Contractor's coordination.
- B. Electronic document exchange service.
- C. Prebid conference.
- D. Preconstruction meeting.
- E. Progress meetings.
- F. Preinstallation conferences.
- G. Project closeout conference.
- H. Requests for information (RFI).
- I. Submittals for review, information, and project closeout.
- J. Number of copies of submittals.
- K. Deferred submittals.
- L. Submittal procedures.
- M. Product submittals detailed requirements.
- N. Timing of submittals.
- O. Construction progress schedule.
- P. Schedule of values.

1.2 RELATED REQUIREMENTS

- A. Section 011000 "Summary" for delegate design requirements.
- B. Section 013200 "Construction Progress Documentation" for form, content and administration of schedules.
- C. Section 014000 "Quality Requirements" for Testing Laboratory Reports and Manufacturer's Field Services.

- D. Section 016000 “Product Requirements” for Contractor's list of Products.
- E. Section 017000 “Execution” for additional coordination requirements.
- F. Section 017800 “Closeout Submittals” for project record documents.

1.3 CONTRACTOR'S COORDINATION

- A. Coordinate Work of personnel, requirements and Work specified throughout the Contract Documents, including Work performed by subcontractors and suppliers.
- B. Coordinate scheduling, submittals, and the work of the various Sections of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Contractor's work and responsibilities include, but are not limited to, the following:
 - 1. Provide all labor, materials, equipment, delivery, tools, machines, facilities, and services necessary for the proper execution of the Work.
 - 2. Coordinate scheduling, submittals and Work of the various Sections of Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
 - 3. Ensure that notification to and inspections by permitting agencies are completed in a timely fashion.
 - 4. Coordinate utility outages with a minimum of 72 hours advance notice to Owner.
 - 5. Store, protect, and secure materials, on and off site.
 - 6. Supervise and coordinate after hours work.
- D. The separation of portions of the Work into particular divisions of the specifications or sections of the drawings may not in every case conform to the categories of work typically subcontracted to particular crafts or trades. Inform bidders, subcontractors, crafts and trades that work assigned to them may be contained in sections other than customary. In every case, provide and coordinate at no additional cost to Owner, all work required in the Contract Documents.
- E. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, all such equipment.
- F. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for piping, ductwork, 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.
 - 1. The Architect may make minor adjustments in fixture, outlet, grille, louver, access hatch or ventilator locations prior to rough-in work with no additional cost.
- G. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish construction and components.

- H. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner occupancy.
- I. 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 activities.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 ELECTRONIC DOCUMENT EXCHANGE SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic Portable Document Format- (PDF-) type files and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to submittal schedule, Requests for Information (RFIs), progress documentation, contract modification documents (e.g. Supplementary Instructions, Change Requests, Change Orders, Construction Change Directives), Applications for Payment, Field Reports and Meeting Minutes, substitution requests and any other document any participant wishes to make part of the project record or as required by the Owner.
 - 2. Contractor and Architect are required to use this service.
 - 3. It is Contractor's responsibility to submit documents in PDF-type file format.
 - a. Name PDF-type files for product submittals is indicated under "Product Submittals - Detailed Requirements" Article.
 - 4. Subcontractors, suppliers, Architect, and Architect's consultants will be permitted to use certain modules available at no extra charge.
 - 5. Users of the service need an email address, Internet access, and PDF-type file review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - 6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
 - 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Training: One, one-hour training session will be arranged for all participants, with representatives of Architect, Architect's Consultants and Contractor participating; further training is the responsibility of the user of the service.

- C. Project Closeout: Coordinate with Architect and Owner to verify that archive documents have been saved and remain accessible to Architect and Owner prior to terminating the service for the project.

3.2 PRECONSTRUCTION MEETING

- A. The Owner, where requested, will schedule a preconstruction conference before the start of construction, at a time convenient to the Owner, Contractor and the Architect. The conference will be held at the Project Site or another convenient location. The meeting shall be conducted to review general issues of responsibilities, communications, and contract administration procedures.

- B. Attendance Required:

1. Owner.
2. Architect.
3. Contractor.
4. Contractor's Superintendent.
5. Major Subcontractors.
6. Major Suppliers when requested; others as appropriate.

- C. Agenda:

1. Status of the Contract, bonds, insurance or other contract requirements.
2. Status/timing of Notice to Proceed.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract and Architect.
6. Contract administration responsibilities, communications and procedures.
7. Project management communications and requirements.
8. Tentative Contractor's construction schedule.
9. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
10. Scheduling.
11. Related work by Owner and coordination with Contractor.
12. Use of premises and ongoing facility operations.
13. Review of existing conditions.
14. Hazardous materials.
15. Owner's requirements.
16. Working hours, site access and parking.
17. Contractor's site mobilization and storage areas.
18. Material and equipment deliveries.
19. Maintaining good neighborhood relations and achieving noise, store water, erosion and dust control.
20. Construction facilities and controls.
21. Temporary storage.
22. Security and housekeeping procedures.
23. Special inspection, testing and quality control, including procedures for testing.

24. Procedures for maintaining record documents.
25. Requirements for start-up of equipment and Commissioning.
26. Inspection and acceptance of equipment put into service during the construction period.
27. Status of permits.
28. Progress meeting schedule date and time.
29. Review of Contract Documents and outstanding questions related thereto.

- D. Owner will record minutes and distribute copies within two working days after meeting to participants, with copies to all participants, and those affected by decisions made.

3.3 PROGRESS MEETINGS

- A. Progress meetings will be conducted at the Project Site on a weekly basis, or at intervals otherwise agreed to. The schedule of the meetings shall be established by mutual consent of the Owner, Architect and Contractor. No changes to said schedule shall be made without mutual consent of the same parties. Coordinate preparation of the payment request with dates of meetings.

1. Notify subcontractors and other representatives of scheduled meetings where their attendance is requested.

- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

- C. Attendees: In addition to representatives of the Contractor, Owner and the Architect, other individuals concerned with current progress or coordination may be represented at these meetings. Participation by subcontractors shall be limited to attendance only when required when a prearranged topic relating to the specific trade or supplier requires their attendance at the meeting.

1. Persons designated by the Contractor to attend and participate shall have all required authority to commit the Contractor to solutions as agreed upon in the meeting.

- D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Status of RFI's, ASI's, Proposal Requests, CCD's and Change Orders.
7. Review of off-site fabrication and delivery schedules.
8. Site access, utilization and parking.
9. Problems from or affecting occupants or neighbors.
10. Permitting and agency issues.
11. Quality/inspection issues.
12. Maintenance of progress schedule:
 - a. Review progress since the last meeting;
 - b. Distribute Contractor's three-week look ahead schedule.
 - c. Evaluate current activity in relation to the Contractor's Schedule.

- d. Identify in advance potential delays involving: submittals, material / equipment procurement; approvals; Owner-furnished materials; or separate contracts, if any.
 - e. Determine how construction behind schedule will be expedited; securing commitments from parties involved to do so.
 - f. Determine whether a recovery schedule is required for the Contractor's Construction Schedule to insure completion within the contract time.
- 13. Coordination of projected progress.
 - 14. Maintenance of quality and work standards.
 - 15. Effect of proposed changes on progress schedule and coordination.
 - 16. Pay Application review at monthly interval.
 - 17. Review of Project Record Documents, both field sets and electronic forms.
 - 18. Contractor's update of status of OCIP enrollment by project participants.
 - 19. Other business relating to Work.
- E. Contractor shall record minutes and distribute copies within three working days after meeting to participants, with one copy to each participant and those affected by decisions made.
- 1. Minutes shall number topics in a manner that reflects when each topic was first raised.
 - 2. Each topic shall reflect who is responsible for acting on the topic and date by which resolution is required.
 - 3. No topic shall be dropped from the minutes until the method of resolution is recorded.

3.4 PREINSTALLATION CONFERENCES

- A. When required in individual Specification Sections, convene a preinstallation conference at work site prior to commencing work of the Section.
- 1. Additional conferences may be conducted as required for performance of the Work.
- B. Attendees: The Installer and representatives of manufacturers and fabricators, sub-contractors, Contractor, Owner's representative and Owner's special inspector involved in or affected by the installation, and its coordination or integration with other materials and installations, shall attend the meeting. Advise the Architect of scheduled meeting dates.
- C. Notify Architect and Owner minimum four working days in advance of meeting date.
- D. Agenda: Review the progress of related construction activities, including drawing and specification requirements for the following:
- 1. Shop Drawings, Product Data, and quality-control samples and other required submittals.
 - 2. Time schedules,
 - 3. Weather limitations.
 - 4. Manufacturer's recommendations.
 - 5. Warranty requirements.
 - 6. Acceptability of substrates.
 - 7. Quality, inspection, and testing requirements.
 - 8. Assessment of risk.

- E. Review conditions of installation, preparation and installation procedures, and coordination with related work.
- F. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- G. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
- H. 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.

3.5 PROJECT CLOSEOUT CONFERENCE

- A. Request a meeting to discuss the requirements for project closeout.
- B. Attendees: In addition to representatives of the Contractor, Owner and the Architect, other individuals concerned with project closeout may be represented at these meetings.
- C. Agenda:
 - 1. Preparation of record documents.
 - 2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - 3. Submittal of written warranties.
 - 4. Requirements for preparing operations and maintenance data.
 - 5. Requirements for demonstration and training.
 - 6. Preparation of Contractor's punch list.
 - 7. Completion time for correcting deficiencies.
 - 8. Inspections by authorities having jurisdiction.
 - 9. Certificate of occupancy and transfer of insurance responsibilities.
 - 10. Partial release of retainage.
 - 11. Preparation for final field observation.
 - 12. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - 13. Submittal procedures, including for the following:
 - a. Project Record Documents.
 - b. Operating and maintenance documents.
 - c. Final commissioning documentation.
 - d. Warranties and bonds.
 - e. Affidavits.
 - f. Turnover of extra materials and spare parts.
 - 14. Owner's partial occupancy requirements.
 - 15. Installation of Owner's furniture, fixtures, and equipment.
 - 16. Responsibility for removing temporary facilities and controls.
 - 17. Final cleaning.

18. Contractor's demobilization of site.
19. Maintenance.

D. Owner will record meeting minutes.

3.6 REQUESTS FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Limit topics on each RFI to a single topic to expedite response.
3. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
4. Endeavor to keep the number of RFI's to a minimum. In the event that the process becomes unwieldy, in the opinion of the Architect, because of the number and frequency of RFI's submitted, the Architect may require the Contractor to abandon the process and submit all requests as either submittals, substitutions or requests for change.
5. Endeavor to answer all RFI's from subcontractors. Only RFI's the Contractor cannot answer shall be submitted through, reviewed by, numbered sequentially by and signed by the Contractor prior to submittal to the Architect.
6. If Contractor disagrees with Architect's response to Contractor's RFI, Contractor shall notify Architect within seven calendar days of receipt of response. Lack of such notification shall be understood to mean that Contractor agrees with response.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. RFI number, numbered sequentially.
5. RFI subject.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Reason for need for interpretation.
10. List of subcontractors involved.
11. Contractor's suggested resolution. If the proposed solution impacts the Contract Time or the Contract Sum, state the impact in the RFI.
12. The following statement:
 - a. "This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order or Construction Change Directive must be executed in accordance with the Contract Documents prior to implementation of the reply. Proceeding with the Work in accordance with this RFI response indicates Contractor's acknowledgement that there will be no change in the Contract Sum or Contract Time."

13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Contractor's software-generated form with the content specified and as acceptable to the Architect.
 - D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow an average five (5) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 1. The following RFIs will be returned without action:
 - a. Requests for approval of substitutions.
 - b. Requests for adjustments in the Contract Time or the Contract Sum.
 - c. Requests for interpretation of Architect's actions on submittals.
 - d. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Request according to Section 012600 "Contract Modification Procedures".
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner in writing within the time stipulated in the Design-Build Contract.
 - b. A response to an RFI is not direction or approval of a change to either Contract Time or Contract Sum.
 - c. Proceeding with the Work in accordance with an RFI response, without such written notification and an approved Change Order or Construction Change Directive, indicates Contractor's acknowledgement that there is no change to the Contract Time or the Contract Sum.
 - E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven calendar days if Contractor disagrees with response.
 - F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit the RFI Log at each Project Meeting. Include the following:
 1. RFI number including RFIs that were dropped and not submitted.
 2. RFI description.
 3. Date the RFI was submitted.
 4. Date Architect's response was received.
 5. Identification of related Minor Change in the Work, Construction Change Directive, Change Order and Proposal Request, as appropriate.

3.7 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with Submittal Procedures article below and for record documents purposes described in Section 017800 "Closeout Submittals".

3.8 DEFERRED SUBMITTALS

- A. For delegated design elements defined in Section 011000 "Summary," submit deferred submittals in accordance with the specified requirements and in accordance with Section 107.3.4.2 of the Oregon Structural Specialty Code (OSSC). Follow City of Seaside requirements current at the time of submission.
- B. Submission will include the following, as a minimum, in quantities as required by the City:
 - 1. Drawings showing all members, sizes, fastener information, where applicable, dimensions, connections, materials used and how attached to the main structure.
 - 2. Calculations, including criteria, design assumptions, substantiating computations, and such additional data sufficient to show compliance with Code.
 - 3. Product information.
 - 4. Drawings and calculations must be stamped and signed by an Engineer registered in Oregon and must have Architect/Engineer of record's submittal review stamp.
- C. Architect or Engineer, as applicable, will review delegated design submittals, and, if the submittal is acceptable and receives a "No Exceptions Taken" or "Make Corrections Noted" action, will forward to the Contractor for submission to the building official with annotation indicating that the deferred submittal documents have been reviewed and that they have been found to be in general conformance with the design of the building.
- D. The Architect's and Engineer's approval is contingent upon approval of submittal by governing authorities.
- E. Contractor shall be responsible for submission to the governing agency and for coordinating with the governing agency for timely review and approval of the submittals. Architect and Owner will not be responsible for delays due to failure of the Contractor to submit with adequate time allowance for agency review of the submittals.

- F. The deferred submittal items shall not be installed until their design and submittal documents have been approved by the building official.
- G. Contractor is responsible for obtaining written approval from governing authority for all Deferred Submittals.
- H. Contractor is responsible for obtaining and costs associated with applicable permits for delegated design elements as required by governing authority.

3.9 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator for Owner. No action will be taken.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout, in accordance with Section 017800 "Closeout Submittals":
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.

3.11 NUMBER OF COPIES OF SUBMITTALS

- A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

- A. Transmit each submittal with a copy of approved submittal form.
- B. Submit Schedule of shop drawings, product data, and samples as specified in each individual Section of the Project Manual. Include submittal and installation dates of each product and assembly. Coordinate with construction schedule and allow ample time, but in no case fewer than 5 working days, for Architect's review. Allow time for possible disapproval, correction, and re-submittal.
- C. Submit submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 1. Provide a separate PDF for each submittal element (Product Data, Shop Drawings, etc.) for each specification Section.
 - a. Submit all elements for any Section as a single submittal at the same time.
 - b. Do not combine submittals for multiple specification Sections, unless previously approved by the Architect.
 - 2. Number submittals as indicated in Product Submittals - Detailed Requirements Article.
 - 3. No secure PDFs allowed.
 - 4. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- D. Identify Project, Contractor, subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents prior to submission.
 - 1. Architect will not accept or process submittals which do not have Contractor's signed stamp that reflects Contractor's review and approval.
 - 2. Submission of submittal by Contractor represents that Contractor has fully reviewed and certified acceptance.
- F. Submit submittals to Architect as indicated in Electronic Document Exchange Service Article above.
- G. Schedule submittals to expedite the Project, and coordinate submission of related items.
- H. Do not fabricate products or begin work which requires submittals prior to return of submittal with Architect acceptance.

- I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
 - 1. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Contractor notates specific deviations and the deviations are specifically approved by the Architect.
- J. Provide space for Contractor and Architect review stamps.
- K. When revised for resubmission, identify all changes made since previous submission.
- L. Submittals not requested will be returned without review.
- M. Contractor is responsible for timely and efficient submittals and the correctness of the documentation submitted. Costs associated with multiple reviews of submittal information beyond one re-submittal (if any) shall be the responsibility of the Contractor.
- N. The Contractor is responsible for timely submittals of any required deferred submittals to the governing agencies.

3.13 PRODUCT SUBMITTALS - DETAILED REQUIREMENTS

- A. Present in a clear and thorough manner. Title each drawing with ProjectName.
- B. Identify field-verified dimensions; show relation to adjacent or critical features of Work or products.
- C. Number submittals by submittal section number, followed by a two letter designation for the type of submittal and a number which sequentially numbers submittals in order submitted to Architect. For example, the initial submittal of Joint Sealers per the requirements of Section 079200 "Joint Sealants", Product Data would be designated 079200-PD-1. If the submittal must be resubmitted it shall be identified as 079200-PD-1R1 and subsequent resubmittal shall be sequentially numbered in order as resubmitted.
- D. Product Data (PD):
 - 1. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number.
 - 2. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
 - 3. Product data that has not been marked to indicate the applicable information will be returned without review.
 - 4. Contractor shall assemble Product Data required for maintenance manuals and submit to Architect in accordance with Section 017800 "Closeout Submittals".

E. Shop Drawings (SD):

1. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproduction of the Contract Documents or standard printed data.
2. Fully illustrate requirements in the Contract Documents including, but not limited to:
 - a. Identification of products.
 - b. Compliance with specified standards.
 - c. Notation of coordination requirements.
 - d. Notation of dimensions established by field measurement.
 - e. Relationship and attachment to adjoining materials or assemblies, relevant field conditions and all necessary dimensions.

F. Samples (SA):

1. Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected. Architect will retain selected sample for confirmation of subsequent submittals.
2. Submit samples to illustrate functional characteristics of products, including parts and attachments.
3. Approved samples which may be used in the Work are indicated in the individual Specification Sections.
4. Label each sample with identification required for transmittal letter.
5. Verification Samples: Submit the number of samples specified in individual Specification Sections. One of which will be retained by the Architect.
 - a. Submit three copies if no number is indicated.
 - b. Submit additional samples when copies will be required for distribution to other subcontractors or fabricators for matching or preparation of finish samples.
6. Provide field samples of finishes at project site, at location acceptable to Architect, as required by individual Specifications Section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed work if approved by Architect.

G. Manufacturer's Instructions (MI):

1. Provide at Minimum: Manufacturer's instructions for storage, preparation, assembly, installation, start-up, adjusting, balancing, and finishing in accordance with Section 014000 "Quality Requirements".

H. Manufacturer's Certificates (MC):

1. When specified in individual Specification Sections, submit manufacturers' certificate to Architect/Engineer for review, in quantities specified herein.
2. Indicate material or product in conformance with or exceeding specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

3.14 TIMING OF SUBMITTALS

A. General:

1. The listing of submittals hereinafter is set forth as a checklist for Contractor's convenience and is general in nature.
2. Architect reserves the right to add to this list in case of omission of any submittals specified in other Sections but not listed hereinafter.

B. Submittals - Within Thirty (30) Calendar Days Following Notice-to-Proceed and Prior to First Payment Application:

1. Schedule of values; submit at least 10 working days in advance of application.
2. Schedule of submittals.
3. Copies of acquired and unacquired building permit licenses etc. to complete the Work of the Contract. Submit copies of any remaining permits as they are acquired.
4. Construction schedule.

C. Submittals - Prior to Each Month's Progress Payment:

1. Submit 10 working days in advance of date established for progress payment.
2. Application and Certificate for Payment (Owner's Payment Application form).
3. Notarized affidavit of payments to all subcontractors and major material suppliers (see application for payment).
4. Updated Construction Schedule.
5. Public Works Contractor Wage Certification per Oregon Law.

D. Submittals - Prior to Request for Substantial Completion:

1. Notification to Architect that Work of the Project is substantially complete.
2. Itemized listing of items of work to be completed or corrected.
3. Submit Certificate of Occupancy or Occupancy Permit issued by the Local Building Department for the entire Project.
4. Draft Operations and Maintenance Manuals and draft warranties.

E. Submittals - Prior to Request for Final Completion:

1. Certified copy of punch list items completed.
2. Submit final Application for Payment.
3. Summary of commissioning indicating all required items are completed.
4. Demonstration and Training; training reports.
5. Final complete and correct Operations and Maintenance Manuals.
6. Record Drawings of Contract Documents with all changes indicated.
7. Final dated and signed Warranties.

3.15 CONSTRUCTION PROGRESS SCHEDULE

- A. Submit initial progress schedule as required in Section 013200 "Construction Progress Documentation".

- B. Revise and resubmit as required.
- C. Review revised schedules with each Application for Payment, identifying changes since previous version.
- D. See Section 013200 "Construction Progress Documentation" for specific requirements.

3.16 SCHEDULE OF VALUES

- A. Submit typed schedule on Owner's Payment Application form. Contractor's standard form or media-driven printout will be considered on request.

END OF SECTION 013000

SECTION 013113 - PROJECT COORDINATION

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. This Section includes administrative and procedural instructions for project coordination.
- B. The Contractor shall use their best skill and attention to coordinate all aspects of the Project and plan the Work in advance of execution so as to achieve each of the following objectives listed below. The Owner is responsible to compensate the Contractor neither for costs nor lost time incurred due to Contractor's failure to meet the objectives required for Project Coordination.
 - 1. The Contractor shall anticipate and thereby prevent circumstances that could necessitate the need for alteration of work following execution.
 - 2. Avoid the need for alteration of existing work not documented in the Contract.
 - 3. Avoid alteration of new work once it has been executed.
 - 4. Avoid sequencing of installation that may affect the performance of the building enclosure and weathertightness.
 - 5. Expedite progress so as to complete the Work within the Contract Time or in advance of scheduled milestones.
 - 6. Prevent conflicts among the various trades engaged in the Work.
- C. When notified by the Owner's representative the Contractor shall provide for the occurrence of work by other prime contractors at the Project site over the course of the Work. Such work may affect site and building access, utilities and other aspects of the Project. Coordinate the Work, and adapt sequence and staging as necessary to accommodate work by other prime contractors and work by the Owner. Periodically during the course of the Work consult the Owner's representative for information on current projects
 - 1. Owner installation of furniture and equipment.
 - 2. Construction in adjacent facilities.
- D. Submittals: General coordination memoranda, drawings, diagrams and schedules, for the coordinated control and utilization of the site, from beginning of construction activity through project close-out and warranty periods
 - 1. Non-standard conditions report; describe condition, location and suggested remedial measures.
 - 2. Coordination Drawings.

- E. Related Requirements.
 - 1. Section 011000 "Summary."
 - 2. Section 013200 "Construction Progress Documentation."
 - 3. Section 016000 "Product Requirements."
 - 4. Section 017000 "Execution."
 - 5. Section 017419 "Construction Waste Management and Disposal."

1.3 CONSTRUCTION ORGANIZATION AND START-UP

- A. Establish on-site lines of authority and communications including the following:
 - 1. Establish procedures of intra-project communications including:
 - a. Submittals.
 - b. Reports and records.
 - c. Recommendations.
 - d. Coordination Drawings.
 - e. Schedules.
 - f. Resolution of conflicts.
 - 2. Contract Documents Interpretation:
 - a. Consult with Architect to obtain interpretation.
 - b. Assist in resolution of questions or conflicts which may arise.
 - c. Transmit written interpretations to Subcontractors and to other concerned parties.
 - 3. Permits and Approvals: Verify that subcontractors have obtained required permits and inspections for work and for temporary facilities.
 - 4. Control Use of Site:
 - a. Supervise field engineering and project layout.
 - b. Allocate field office space and work and storage areas for use of each subcontractor.
 - c. Schedule, coordinate, and facilitate combined efforts of Engineer of Record and mechanical and electrical subcontractors to achieve Design Assist of mechanical and electrical systems.
 - d. Develop a pre-fire protection plan to be maintained on-site and provided to the building or fire code official upon request.

1.4 COORDINATING SUBCONTRACTORS' WORK

- A. Coordinate the work of all subcontractors and make certain that, where the work of one trade is dependent upon the work of another trade, the work first installed is properly placed, installed, aligned, and finished as specified or required to properly receive subsequent materials applied or attached thereto.
- B. Direct subcontractors to correct defects in substrates they install when subcontractors of subsequent materials have a reasonable and justifiable objection to such surfaces.

- C. Do not force subcontractors to apply or install product to improperly placed or improperly finished substrates that would result in an unsatisfactory or unacceptable finished product.
- D. When the work of a subcontractor is critical to the Project schedule, coordinate the reasonable efforts of that subcontractor to ensure adherence to the schedule, including added labor, materials, equipment, tools, construction, equipment, machinery, or other facilities as necessary to accelerate the construction.

1.5 COORDINATING WORK WITH OWNER'S WORK AND OTHER CONTRACTOR'S WORK

- A. Coordinate and make certain that where work of either party is dependent upon the other party, the work first performed is properly placed, installed, aligned, and finished as required to permit the proper installation of the following work.
- B. If the other work in any way interferes with the Contractor's work so notify the other party sufficiently in advance so that the other party has reasonable time to make necessary adjustments.
- C. If the Contractor's work in any way interferes with the other party's work, so notify the other party as soon as possible. The Contractor shall modify its schedule as reasonably necessary to accommodate the other party's work.

1.6 COORDINATION DRAWINGS

- A. The Contractor shall provide for participation by representatives of each of the trades or entities involved in the execution of work to be documented by the coordination drawings, where required, who shall be knowledgeable of all the requirements for the Work and fully authorized to act on behalf of the entity or firm they represent. Coordination drawings are not limited to shop drawings required in individual specification sections.
- B. Comply with Shop Drawing requirements where shop drawings serve as coordination drawings between trades.
- C. Coordination meetings for coordination drawing review shall be held at regularly scheduled intervals appropriate to the status of the Work and sufficiently in advance of execution to avoid the need for modifications to work already in place and prevent any delay in progress.
- D. Review shop drawings and coordination drawings prior to submission to Architect.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall notify Owner of conditions created and uncovered during the Work that may complicate completion of subsequent work. Such conditions include but are not limited to substrate profile, coatings, integrity, voids and protrusions and other conditions. Report non-standard and potentially problematic conditions in writing, and suggest remedial measures.
- B. Contractor: Responsible for knowing the general character of each item of new work to be installed in areas where Work is performed, and understand the standard conditions and substrate characteristics for proper installation of the new work.
 - 1. Utilize coordination drawings and field verification of dimensions and measurements to ensure mechanical, plumbing, electrical and other building systems and equipment are coordinated with building structure and architectural features. Verify physical dimensions of equipment with the space available and ensure necessary clearances exist for execution, operation and maintenance.
 - 2. Manufacturer's Instructions: Where new work will include manufactured products, inspect manufacturer's instructions and recommendations for installation. Provide conditions complying with the manufacturer's recommendations.

END OF SECTION 013113

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Preliminary baseline schedule.
- B. Final construction baseline schedule.
- C. Progress reports.
- D. Material location reports.
- E. Field condition reports.
- F. Special reports.

1.2 REFERENCES

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America.

1.3 SUBMITTALS

- A. Preliminary Baseline Schedule: Within 14 calendar days after date of Owner's Notice of Intent to Award the Contract, submit preliminary baseline schedule defining planned operations for the entire scope of Work.
 - 1. Hard copies of the schedule will be available upon request.
 - 2. If preliminary baseline schedule requires revision after review, submit revised schedule within 10 working days.
 - 3. The data date is to be set to Notice of Award.
- B. Final Construction Baseline Schedule: Within 30 calendar days after date established in Notice to Proceed, submit draft of proposed complete schedule for review.
 - 1. Include written certification that mechanical and electrical Subcontractors have reviewed and accepted proposed schedule.
 - 2. Neither Owner nor Architect shall be responsible for review of the entire substance of the Progress Schedule.
 - 3. Submit updated schedule with each Application for Payment.

4. At each progress meeting, submit the following:
 - a. Weekly Progress Schedule: Once the Final Baseline Schedule has been approved, the Data Date will be advanced. The Data Date will be set to the Monday of each week at the start time (08:00 if work starts at 8:00). Data Date is to be advanced weekly throughout the duration of the project. Prepare a three-week look-ahead schedule listing current and upcoming activities by trade, including anticipated start and complete dates as applicable.
 5. Submit the following at the end of each month:
 - a. Monthly Progress Schedule: The last weekly update in a month will be submitted as the Monthly Progress Schedule. Coordinate with the Owner as to which weekly progress schedule to use if the start or end of the month falls on an unusual day of the week.
- C. Progress Reports: Submit at weekly intervals.
- D. Field Condition Reports: Submit at time of discovery of differing conditions.
- E. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Scheduling Kick-Off Meeting: Within seven (7) calendar days of receipt of Owner's Notice of Intent to Award, coordinate with Owner to schedule a Scheduling Kick-Off Meeting. The purpose of the meeting is to:
 1. Allow the Contractor to receive and review the Owner's existing detailed master schedule.
 2. Discuss implementation of the Contractor's schedule.
 3. Review project scheduling requirements.
 4. Memorialize any acceptable deviations from requirements.
- B. Scheduler: Designate a person or firm for managing the CPM schedule and database. This includes preparation, revisions, updating, and required submittals. The Project Scheduler shall be approved by the Owner based on a resume indicating as a minimum four (4) years of experience with CPM schedules on construction projects of similar size and complexity. The Owner may reject the Project Scheduler or firm if they are unable to produce an approved or organized schedule, even if they meet the above qualifications.
 1. At any time, the Owner may request the presence of the scheduler at any meetings to review the schedule's logic.

1.5 SCHEDULE FORMAT AND GENERAL REQUIREMENTS

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

- B. Diagram Sheet Size: Maximum 30 by 42 inches or width required.
- C. Scale and Spacing: To allow for notations and revisions.
- D. Schedule submittals shall include required reports and data file transmitted via email and/or FTP site. The file shall contain the entire schedule including assigned resources. Each file submittal should have a unique file name indicating baseline, weekly or monthly, Contractor's name and the Data Date. Each report should have the Data Date, Contractor's name and report name.
- E. The schedule may be used as the basis for determining Contract earnings during each update period and therefore the amount of each progress payment.
 - 1. Lack of an approved schedule, qualified scheduling personnel, or failure of Contractor to provide required information will result in disapproval of schedule and may be grounds for withholding progress payments and/or for a determination by the Owner that Contractor is not prosecuting Work with sufficient diligence to ensure completion within the time specified in the Contract.
 - 2. Upon making this determination, the Owner may terminate the Contractor's right to proceed with the Work, or any separate part of it, in accordance with the default terms of the Contract. If, in the opinion of the Owner, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the Owner, without additional cost to the Owner. In this circumstance, the Owner may require the Contractor to increase the number of shifts, overtime operation, days of work and/or the amount of construction, and to submit for approval any supplementary schedule or schedules as the Owner deems necessary to demonstrate how the approved rate of progress will be regained.

PART 2 - PRODUCTS

2.1 PRELIMINARY BASELINE SCHEDULE

- A. Prepare preliminary baseline schedule in the form of a preliminary network diagram.
 - 1. Utilize Microsoft Project.
- B. Content:
 - 1. Illustrate entire scope of Work at a high level with at least one activity per subcontractor or responsibility per general area.
 - 2. Owners' tasks that Contractor will be relying on for timely completion of the project.
 - 3. Submittals required to allow construction to begin. Allow two (2) working days for review of submittals by the Owner. Include both a Contractor's submittal and an Owner's review as two separate activities.
 - 4. Major or long lead procurement items being procured by either the Owner or the Contractor. Consult with Owner on procurement items or durations prior to the Preliminary Baseline Schedule submittal.
 - 5. Required activity coding.

6. Punch List Activities: Include separate punch list steps for building interior versus building exterior tasks. Include separate activities for Contractor punch list, Contractor corrections, Owner/Architect punch list, and Contractor corrections. Allow a minimum of 5 working days for the initial Owner/Architect punch list.
7. Commissioning Activities: Include a minimum of 3 working days for total commissioning.
8. Include Owner Controlled Float Activities as specified.
9. Utilize correct logic and relationship ties.
10. Utilize Contractor's best estimate on activity durations.
11. Milestones from the contractual milestone list and interim phasing and goal type milestones.
12. Only contractual constraints are allowed. Schedule constraints shall be pre-approved by the Owner.
13. Only two open ends: The first activity - Notice to Proceed - has no predecessor and the last activity - Project Complete - has no successor. All other activities have both a predecessor and successor.
14. Coordinate with existing Owner Schedule for integration as requested by Owner.
15. Incorporate Owner comments.
16. Provide separate schedule of submittal dates for shop drawings, product data and samples, Owner-furnished products, products identified under Allowances and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
17. Include a line item for Project Closeout.
18. Allow adequate duration to for full startup and commissioning.
19. Indicate delivery dates for Owner-furnished products and products identified under Allowances.
20. Include not more than 30 calendar days for punch list and final completion, unless otherwise indicated.
21. Provide legend for symbols and abbreviations used.
22. Closeout and Commissioning: In the Contractor's Construction Schedule, provide key activities required in Sections 017700 "Closeout Procedures", and 017800 "Closeout Submittals" and 019113 "General Commissioning Requirements". These activities will be cost-loaded to a cumulative total of not less than 2 percent of the Contract value.

2.2 FINAL BASELINE SCHEDULE

- A. The approved Final Baseline CPM Schedule is to be used as the master schedule. It will be used to measure the progress of the Work and aid in evaluating time extensions. After approval, the Final Baseline will be archived and a copy will be used to begin the weekly update process. The Final Baseline CPM Schedule is to include:
 1. All requirements of the Preliminary Baseline Schedule.
 2. Required submittals and review periods.
 3. Illustrate the complete scope of work with general area, sub-area, and subcontractor level tasks (not day by day or overly specific sequences unless required due to craft interaction, hold points, or other inspections).
 4. Activities should have only one subcontractor per activity. All subcontractors should have at least one activity. If there are planned gaps in work, use multiple activities to represent their work.
 5. Construction activities should be 20 working days or less in duration unless approved by the Owner.

2.3 WEEKLY PROGRESS SCHEDULES

- A. The Weekly Progress Schedule is to be updated weekly and will be considered the contemporaneous master schedule. It may be used as an aid in evaluating time extensions. The Data Date will be set by the Contractor at the normal start time of the primary construction calendar (08:00 if work starts at 8:00). Data Date is to be advanced weekly throughout the duration of the project. Activities behind (to the left of) the Data Date will have been completed. Activities in front (to the right) of the Data Date have not started. Activities crossing the Data Date are in progress. The Weekly Progress Schedule should:
1. Accurately update the actual start and finish date of all activities that occurred during the previous week.
 - a. The Start Date is the date upon which the Work is commenced in earnest, not preliminary or preparatory work, unless identified as such in the schedule.
 - b. Finish Date will be the date at which the Work is Substantially Complete enough for follow-on work to begin. It does not signify that any or all punch list items are complete or that the Work can be billed for 100 percent. Earned value will be evaluated separately from substantial progress.
 2. Accurately update the Remaining Duration for Work that is statused as In Progress at the time of the update. Remaining Duration shall be updated independently of activity Percent Complete.
 3. Accurately update the achieved Percent Complete of each task activity as of the end of the preceding week. Use of Earned Value tracking methods is recommended but not required.
 4. Document all delays that occurred during the week. Add an activity for that delay with actual start and finish dates and discuss these activities at the weekly schedule meeting.
 5. Activities two weeks or less in front of Data Date can be changed to show slight estimated duration changes, sequence/logic changes or changes in calendars (work on weekends) so as to better illustrate how the work will be executed.
 6. If multiple calendars are used, include a column on all reports showing the calendars.
 7. Changes beyond two weeks out can only be adjusted for the Monthly Progress Schedule and must be documented in the Monthly Narrative.
 8. Submit PDF reports listed in the report section and data on a weekly basis by close of business on each Monday.
 9. Incorporate Owner comments.
 10. Dates from previous weeks cannot be changed once the weekly progress schedule has been submitted except with permission from the Owner.
 11. All schedule mechanics must be followed on each update.
- B. Weekly Schedule Update Review: The Contactor's Project Manager, Authorized Scheduler, Key Subcontractors and Owner shall attend to review the following:
1. Status of Just Complete Tasks: From the weekly schedule update, review last week's tasks, including Actual Start dates (AS), Actual Finish Dates (AF), Remaining Durations (RD) and Percent Complete.
 2. At a minimum, address the following items on an activity by activity basis during each progress meeting.
 - a. Discuss all delays that occurred during the week and recovery plans.

- b. Upcoming Activities: Review logic, duration, crew size, material or equipment needs.
 - c. Critical Activities: Understand and review the activities that must finish on time to avoid a delay to the project completion date. Discuss opportunities to complete these tasks early.
- C. Schedule Constraints: Minimize the use of activity schedule constraints as much as possible. Mandatory and Start On or Finish On type constraints are not allowed.
 - 1. Project Complete: Include as the last activity in Project Schedule an activity called "Project Complete". "Project Complete" should be a finish milestone activity type and have a constraint of finish on or before. Use the end of the day of the Contract completion date for the constraint date and time. The schedule calculations shall result in a negative float when the calculated late finish date of the last activity is later than the contract completion date. The schedule shall have no constrained dates other than those specified in the Contract unless approved by the Owner.
 - 2. Just-in-Time Deliveries: The use of "As Late as Possible" constraint may be allowed for Owner's Procurement items with prior approval of the Owner. If the "As Late As Possible" constraint is used for the Owner's procurement, use a finish milestone activity type and an Activity ID that begins with a P for procurement so those activities are quickly recognized in the constraint list. For example, Activity ID would be P-1000 or P-1010, etc. Once an anticipated delivery date is known, it would be changed to a Finish On or After Constraint. Once the item has arrived on site, remove the constraint and replace with an actual date. Contractor procured items should have a submittal review and procure/deliver activities and not be constrained.
 - 3. Contractor may utilize "As Late as Possible" constraints for activities like Crane or Equipment Mobilization, Scaffold Erection, or other supporting type works that are needed to occur just prior to the start of the construction activity.
 - 4. Interim Completion Dates: Constrain contractually specified interim completion dates with a Finish On or Before constraint to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date. Use an activity type of finish milestone and put the activity in the Milestone Grouping.
 - 5. Open Ended Logic: There shall only be two open ended activities. The activity Start Project/Notice to Proceed will have no predecessor logic and the activity Project Complete will have no successor logic.
- D. Required Activities and Level of Detail Required: Develop the Project Schedule to an appropriate level of detail. Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. The Owner will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:
 - 1. Include tasks for the following:
 - a. "Prepare, Submit" and "Review, Approve" for submittals that affect the project schedule.
 - b. Include closeout activity.
 - c. 3rd party Inspections, if requested by the Owner.
 - d. Permits. Allow a minimum of 40 calendar days for the "Review, Issue" of each permit. Coordinate with the Owner the anticipated duration.

- e. Procurement, Construction, Commissioning Activities: Coordinate punch list and commissioning sequence with Owner.
 - f. "Prepare, Submit", "Review, Approve" and "Procure, Fab and Deliver" of long lead or major materials, equipment, etc.
 - g. Owner's Activities, include, but are not limited to, reviews, approvals, inspections, Owner Furnished Equipment (OFE), and Notice to Proceed (NTP), etc.
2. Milestones: The schedule must include start and finish milestones, all contractual milestones and any interim milestones specified by the Owner.
 3. Early Project Completion: In the event the Baseline or Progress Update Schedule calculates an early completion date of the last activity to the Contract Completion date and the schedule calculates positive float, the Contractor shall include an activity named "Contractor Contingency" with no cost and a duration equal to the number of calendar days from the date all the contract work is planned to be completed to the official contract completion date as awarded. This activity should only be adjusted on the monthly update.

2.4 SCHEDULE-DRIVEN REQUIREMENTS

- A. A schedule for the purchase, delivery, and receipt of critical items required for performance of the Work, showing lead times between purchase order placement and delivery dates, shall be integrated with the Construction Progress Schedule. Neither the Architect nor the Owner shall be deemed to have approved or accepted such material, or its schedule, nor deemed to have waived this requirement if some or all of the material is not received.
- B. Should the Contractor fail to meet a scheduled date as shown on the current Construction Progress Schedule, the Contractor shall, if requested, be required at its own expense to submit within ten days of the request an updated Construction Progress Schedule.
 1. If the Contractor's progress indicates to the Owner that Work will not be Substantially Complete within the Contract Time, the Contractor shall, at its own expense, increase its work force and/or working hours to bring the actual completion dates of the activities into conformance with the Construction Progress Schedule and Substantial Completion within the Contract Time.
 2. The Contractor shall reschedule and also submit a revised Construction Progress Schedule at its own expense within ten days of notice from the Architect that the sequence of work varies significantly from that shown on the current Schedule showing work to complete on original Contract Time with approved extensions. Neither the Owner nor the Architect will, however, be obligated to review the substance or sequence of the Construction Progress Schedule or otherwise determine whether it is correct, appropriate or attainable.
- C. Schedule Float Utilization:
 1. Float time to activities not on the critical path shall belong to the Project, and may be used by the Project to optimize its construction process. Float time between the end of the final construction activity and the final completion date shall belong to the Owner, and may be used by the Owner in determining if additional Contract days are to be awarded for changes in the Contract or for delays to the Contractor caused by the Owner. The Contractor will not be entitled to adjustment in Contract Time, Construction Schedule, or Contract Sum, or to additional payment of any sort by reason of the Owner's use of float time between the

end of final construction activity and final completion date or, by reason of the loss or use of any float time, including time between the Contractor's anticipated completion date and end of the Contract Time, whether or not the float time is described as such on the Construction Progress Schedule.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Owner and Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.

3.2 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Update diagram to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.3 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Preconstruction photographs.
- B. Periodic construction photographs.
- C. Final completion construction photographs.

1.2 RELATED REQUIREMENTS

- A. Section 013000 "Administrative Requirements": Submittal requirements.

1.3 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.

1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.
- B. Do not display photographs in publications without permission of Owner.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG-type file format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 1600 by 1200 pixels and 400 dpi.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.

- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Key Plan: Include digital copy of key plan with each electronic submittal; include point of view identification in each photo file name.
 - 3. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Owner.

- C. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Take a minimum of 100 photographs as necessary to show existing conditions on or adjacent to property before starting the Work.

- D. Periodic Construction Photographs: Take a minimum of 100 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- E. Final Completion Construction Photographs: Take a minimum of 100 color photographs after date of Substantial Completion for submission as project record documents.

END OF SECTION 013233

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance submittals.
- B. Mock-ups.
- C. Control of installation.
- D. Testing and inspection services.
- E. Manufacturers' field services.

1.2 RELATED REQUIREMENTS

- A. Section 013000 "Administrative Requirements" for submittal procedures.
- B. Section 014216 "Definitions".
- C. Section 016000 "Product Requirements" for material and product quality requirements.

1.3 SUBMITTALS

- A. Shop Drawings: For integrated exterior mock-ups, provide plans, sections, and elevations, indicating materials and size of mock-up construction.
 - 1. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Testing and Inspection Plan: Submit for Owner's and Architect's knowledge.
 - 1. Provide copies to Owner's testing and inspection agencies and authorities having jurisdiction.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

- D. **Manufacturer's Instructions:** When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- E. **Manufacturer's Field Reports:** Submit reports in quantities specified for Product Data.
 - 1. Submit report within 30 days of observation to Architect for information.
- F. **Contractor's Statement of Responsibility:** When required by authorities having jurisdiction, submit copy of written statement of responsibility, in accordance with Section 1709.1 of the Oregon Structural Specialty Code, sent to authorities having jurisdiction and the Owner before starting work on the following systems.
 - 1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic systems and seismic-force-resisting systems statement of inspections indicated on the Structural Drawings.
 - 2. Main wind-force resisting systems and wind-resisting components listed in the wind-force-resisting systems statement of special inspections indicated on the Structural Drawings.
- G. **Permits, Licenses, and Certificates:** For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.4 DEFINITIONS

- A. **Mock-ups:** Where indicated, physical assemblies that are constructed on-site. Mock-ups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mock-ups are not Samples. Unless otherwise indicated, approved mock-ups establish the standard by which the Work will be judged.
- B. **Preconstruction Testing:** Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- C. **Experienced:** When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.5 CONFLICTING REQUIREMENTS

- A. **Metal Thickness:** Where thickness of metals is designated in both gage and thickness in inches, the thickness in inches shall govern. Gages are provided for convenience only. Specified submittals for metals shall indicate thicknesses in inches.

1.6 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

1.7 TESTING AND INSPECTION AGENCIES

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Develop a plan for testing and inspection, including all off-site testing requirements, for review by Architect, Authorities having jurisdiction, Owner and Owner's testing agencies. Excessive testing and inspection costs associated with Contractor's means and methods shall be the responsibility of the Contractor. Testing and inspection shall be contemplated in the Contractor's work plan and phased with Work to mutually benefit both the Contractor's scope and efficiency of testing.
 - 2. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Structural Observation Program: The Structural Engineer of Record (SER) shall perform structural observation based on the requirements of the Oregon Structural Specialty Code. Refer to General Structural Notes on Drawings for tabulation of structural observation items and additional requirements. Provide sufficient notice and access to the Structural Engineer of Record in order for the SER to perform required observations.

1.8 MANUFACTURER'S FIELD SERVICES

- A. Manufacturer's Field Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

- A. Mock-ups: Before installing final portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements as indicated, using materials indicated for the completed Work:
 - 1. Build mock-ups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mock-ups will be constructed.

3. Employ supervisory personnel who will oversee mock-up construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's acceptance of mock-ups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mock-up.
6. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mock-ups when directed, unless otherwise indicated.

3.3 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 2. Perform specified sampling and testing of products in accordance with specified standards.
 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of specified tests/inspections.
 - a. One copy of all testing and inspection reports shall be promptly sent directly to the Contractor, Architect, Owner, Structural Engineer, Building Department, Soils Engineer (Soil Compaction), unless otherwise directed.
 - b. In addition to written reports, immediately notify by telephone Architect, Owner and Contractor of any portions of the work found to be in non-compliance with the Contract Documents.
- C. Limits on Testing/Inspection Agency Authority:
 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To facilitate geotechnical monitoring.
 - e. To provide storage and curing of test samples.
4. Notify Architect and laboratory 48 hours prior to expected time for operations requiring testing/inspection services.
 - a. When tests or inspections cannot be performed, through the fault of the Contractor, reimburse the Owner for the additional costs incurred.
 - b. Schedule testing and inspection so that the services of testing and inspection personnel will be as continuous and brief as possible.
 - c. Reimburse Owner for travel and lodging expenses incurred for testing and inspection services performed outside radius of 100 miles of the site.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements
 - a. When tests or inspections cannot be performed, through the fault of the Contractor, reimburse the Owner for the additional costs incurred.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - a. Schedule testing and inspection so that the services of testing and inspection personnel will be as continuous and brief as possible.
 - b. Reimburse Owner for travel and lodging expenses incurred for testing and inspection services performed outside radius of 100 miles of the site.
- E. Contractor shall be responsible for coordinating testing services so as to insure that tests are performed and reports delivered in a manner not to cause delays to the Work. Allow adequate time for inspection, geotechnical monitoring and any needed corrections before proceeding to the next construction stage.
- F. Furnish records, drawings, certificates, and similar data as may be required by the testing personnel to assure compliance with the Contract Documents.
- G. Provide to the testing agency the approved design mix to be used for concrete, mortar, grout, and other materials mixes which require testing by the testing laboratory. Furnish copies of product test reports performed by Contractor as required by Contract Documents.
- H. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- I. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.4 INSPECTION AND TESTING LABORATORY REPORTS

- A. The testing agency will perform and furnish the following:
1. Laboratory Test Reports: Furnish laboratory test reports of materials and construction as required, including:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory or engineering firm name, address, and telephone number.
 - d. Name and signature of representative.
 - e. Description of method of test.
 - f. Identification of sample and portion of the work tested
 - g. Description of location in the work of the sample.
 - h. Time and date of obtaining sample.
 - i. Time and date of test of sample.
 - j. Weather and climatic conditions.
 - k. Evaluation of results tests, including recommendations for action, when requested by Architect or Structural Engineer.
 2. Field Inspection Reports: Furnish field inspection reports for each site visit documenting activities, observations, and inspections of work being inspected include:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing Laboratory or engineering firm name, address, and telephone number.
 - d. Name and signature of representative.
 - e. Observations on weather and climatic conditions.
 - f. Time and date
 - g. Conditions and/or status of the work being inspected.
 - h. Actions taken.
 - i. Recommendations or evaluation of the work.
 3. Reports will be submitted to Owner and Architect in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.

3.5 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

- C. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.

3.6 DEFECT ASSESSMENT

- A. When tests or inspection indicate non-compliance with the Contract Documents, subsequent retesting occasioned by such noncompliance shall be performed by the same personnel as performed the initial tests or inspections, and the additional cost shall be paid by the contractor as stipulated under the Conditions of the Contract.
- B. Contractor shall remove and replace any work found defective or not in compliance with the Contract Documents at no additional cost to Owner, and furnish notice for retesting as specified herein above.
- C. Replace Work or portions of the Work not conforming to specified requirements.
- D. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

3.7 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014005 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED REQUIREMENTS

- A. Section 016000 "Product Requirements" for fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- B. Section 017000 "Execution" for examination, preparation, and general installation procedures.

1.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

1.4 SUBMITTALS

- A. See Section 013000 "Administrative Requirements" for submittal procedures.
- B. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
- C. Include in Request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work, and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 012500 "Product Substitution Procedures".

PART 3 - EXECUTION

3.1 GENERAL

- A. Execute cutting, fitting, patching and finishing including excavation and fill, to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install ill-timed work.
 - 3. Match work that has been cut to adjacent work.
 - 4. Repair areas adjacent to cuts to required condition.
 - 5. Repair new work damaged by subsequent work.
 - 6. Remove and replace defective and non-conforming work.
 - 7. Remove samples of installed work for testing.
 - 8. Provide openings in elements of Work for penetrations of mechanical and electrical work.
 - 9. Provide finished appearance of surfaces and to match adjacent surfaces (unless otherwise noted) affected by the Work.

3.2 INSPECTION

- A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- B. After uncovering, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.
- D. Review District's current AHERA Management Plan and the Hazardous Materials Survey included in the Project Manual to become aware of any asbestos containing materials or lead containing painted surfaces that may be impacted prior to the execution of the Work.
 - 1. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the Work.

3.3 PREPARATION

- A. Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of Project from damage.
- B. Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations. Maintain excavations free of water.
- C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.4 PERFORMANCE

- A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- C. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. When possible, remove existing materials back to joints or break points. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 5. Roofing: At locations where existing roofing must be removed to accommodate new construction, remove roofing, including insulation as necessary. Provide a temporary cutoff in strict accordance with roofing manufacturer's recommendations, to provide a 100 percent watertight seal.
 - a. If any water is allowed to enter under the existing roofing, the affected area shall be removed and replaced at Contractor's expense.

- D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; 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.
 4. Replacement of defective work will not create new seams or joint lines.
 5. Restore work with new products in accordance with requirements of Contract Documents.
 6. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 7. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, full thickness of the construction element.
- E. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 FIELD QUALITY CONTROL

- A. See Section 014000 "Quality Requirements" for additional requirements. Materials subject to testing and inspection in the specifications shall be retested after cutting and patching operations are completed.

END OF SECTION 014005

SECTION 014216 - DEFINITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.2 SPECIFICATION EXPLANATION

- A. The specifications are divided into Divisions and Sections for the convenience of writing and using. The titles of these are not intended to imply a particular meaning or to fully describe the work of each Division or Section and, are not an integral part of the text which specifies the requirements. The Architect is not bound to define the limits of any subcontract and, will not enter into disputes between the Contractor and its employees, including subcontractors.
- B. These Specifications are of the abbreviated or "streamlined" type and include incomplete sentences. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
- C. Omissions of words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.
- D. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

1.3 DEFINITIONS

- A. The definitions in this Section are not necessarily complete or exclusive but, generally, apply to all portions of the Work. Some contractual definitions appear in the General Conditions. Definitions of words of a special nature which relate to Work covered in one or two Sections of the Specifications are included in such Sections. Terms used throughout the Contract Documents are defined in this Section.
- B. Approve: Where used in conjunction with the Architect's or Engineer's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions. In no case will "approval" by the Architect be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled. The term "or approved" used in conjunction with specified materials means "properly submitted and approved substitution request."

- C. Contractor: The term "Contractor" means the prime contractor as defined in the Owner- Contractor Agreement.
- D. Coordinate: The term "coordinate" means satisfactorily combine the work of all trades for a complete and operating installation.
- E. Directed, Requested, etc.: Unless otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Architect", "requested by the Architect", etc. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
- F. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.
- G. General Requirements: The provisions or requirements of Divisions 01 Sections apply to entire work of Contract and, where so indicated, to the other elements of work which are included in the Project.
- H. Guarantee and Warranty: "Warranty" is generally used in conjunction with products manufactured or fabricated away from the project site, and "guarantee" is generally used in conjunction with units of work which require both products and substantial amounts of labor at the project site. The resulting difference is that warranties are frequently issued by manufacturers and frequently supported (partially) by product guarantees from contractors and/or installers.
- I. Indicated: A cross reference to details, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- J. Install: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- K. Installer: The person or entity engaged by the Contractor or their subcontractors for the performance of a particular unit of work at the Project site, including installation, erection, application and similar required operations. It is a general requirement that Installers be recognized experts in the work they are engaged to perform.
- L. Owner: The term "Owner" as used in the Project Manual refers to the Seaside School District.
- M. Product: The term "product" as used in the Project Manual includes materials, systems, and equipment provided by the Contractor for use in the Work.
- N. Project Manual: The term "Project Manual" is the volume which includes the Bidding Requirements, Conditions of the Contract, and the Specifications, Divisions 01 through 33 inclusive, as applicable, and as listed in the Table of Contents bound therein.

- O. Provide: Except to the extent further defined, the term "provide" means to furnish and install, complete and ready for the intended use.
- P. Selected: The term "selected" means "selected by the Architect and Owner"; the Architect shall be the sole judge of the acceptability of a product or an installation.
- Q. Project Site: Space available to the Contractor for performing the Work under this Contract, either exclusively or in conjunction with other contractors as part of the overall Project. The Site may be unimproved vacant land, an existing building or space within an existing building. The extent of the Site is shown on the Drawings.
- R. Specification Language: Imperative language is used, generally, throughout the Specifications. Requirements expressed imperatively are to be performed by the Contractor. For clarity at certain locations, contrasting subjective language is used to describe responsibilities, which must be performed by the Contractor or, when so noted, will be performed by others.
- S. Subcontractor: The term "subcontractor" is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site, or supply materials and/or equipment for the Work. Requirements indicated and applicable to the Contractor shall apply to the subcontractor and authorized representatives of the subcontractor.
- T. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

PART 2 -

PRODUCTS

NOT USED

PART 3 -

EXECUTION

NOT USED

END OF SECTION 014216

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary utility installation.
- B. Support facilities installation.
- C. Security and protection installation.
- D. Mold and moisture control.
- E. Removal of temporary utilities, facilities and controls.

1.2 RELATED REQUIREMENTS

- A. Section 015713 "Temporary Erosion & Sediment Control"
- B. Section 017000 "Execution" for progress cleaning.
- C. Section 017419 "Construction Waste Management and Disposal".

1.3 SUBMITTALS

- A. Staging: Submit staging and logistics plan on Project Site Plan to District and governing authorities for review and approval prior to commencement of Work.
- B. Erosion and Sediment Control Plan: Show compliance with requirements of Section 015713 "Temporary Erosion and Sediment Control" or authorities having jurisdiction, whichever is more stringent. Contractor shall keep submittal logs on site and inspections as required by AHJ. Submit all plan revision to Engineer for review and approval.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
 - 1. Indicate sequencing of work that requires water and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

- D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of the work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air filtration system discharge.
 4. Other dust-control measures.
 5. Waste management plan.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Utility Usage Charges: Owner will pay for utility usage charges.
1. Owner will furnish reasonable quantities of water and electricity to the Contractor without charge. Contractor shall be responsible for both temporary utility connections and disconnects, and all associated costs. Obtain permission of the Owner and authorities having jurisdiction prior to accomplishing either.
- B. Common-Use Field Office: Of sufficient size to accommodate collaborative needs of Owner, Architect and Contractor for project meetings specified in Section 01 30 00 "Administrative Requirements" and various group meetings. Keep office clean and orderly. Equip offices as follows:
1. Pay for temporary mobile unit permits as required by the local governing agencies.
 2. Conference room of sufficient size to accommodate meetings of ten individuals.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

- A. Temporary Utility Installation, General:
1. Engage local utility companies to install temporary service or to make connections to existing service.
 2. Arrange with the companies and existing users for an acceptable time when service can be interrupted to make connections.
 3. Establish a service implementation and termination schedule. As early as possible, change to use of permanent service, to enable removal of the temporary utility and to eliminate any possible interference with completion of the Work.
 4. Provide adequate capacity for each stage of construction.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. Exercise measures to conserve water.
1. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.
 2. Use trigger-operated nozzles for water hoses, to avoid waste of water
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
1. Supply toilet tissue, hand sanitizer, and similar disposable materials as appropriate for each facility. Provide covered waste containers for used material.
 2. Provide adequate number of facilities for use by all persons and trades employed on Work during construction period.
 3. Maintain daily in clean and sanitary condition.
 4. Toilets: Use of Owner's existing toilet facilities will not be permitted.
- D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
1. Provide power outlets for construction operations, with branch wiring and distribution boxes located as needed. Provide flexible power cords as required.
 2. Power connection and consumption shall not disrupt Owner's need for continuous service.

- F. Telecommunication and Digital Document Service: Provide temporary telecommunication service for use by all construction personnel.
1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
 2. Internet Connections: Minimum of one DSL modem or faster. Provide adequate coverage.
 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Vehicular Access and Parking: Conduct the Work so as to ensure the least possible obstruction to vehicular traffic and inconvenience to the general public and the residents in the vicinity of the Work and to ensure the protection of persons, property and natural resources. No road or street shall be closed to the public except with the permission of the Owner and the proper governmental authority. Make temporary provisions to ensure the use of sidewalks, fire lanes, private and public driveways and proper functioning of gutters, sewer, inlets, drainage ditches and culverts, irrigation ditches and natural water courses, if any on the Work site.
1. Parking area for project visitors and construction personnel shall be at location designated by Owner.
 2. Construct and maintain temporary access to public thoroughfares to serve construction area, as necessary.
 - a. Relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
 3. Coordinate access and haul routes with governing authorities and Owner.
 4. Provide and maintain access to fire hydrants, free of obstructions.
 5. Provide means of removing mud from vehicle wheels before entering streets.
 6. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
 7. Provide barricades, warning signs, flag men or other traffic regulators which may become necessary for protection of public, construction personnel and property.
 8. Protect existing pavement and driveways from damage from construction equipment.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 017000 "Execution" for progress cleaning requirements.
1. Comply with requirements of Section 017419 "Construction Waste Management and Disposal".
 2. Provide construction dumpsters. Do not intermingle trash with school dumpsters.
 3. Provide waste recycling bins and containers for metal, glass, cardboard, gypsum, etc. Provide for pick-up on a regular basis so as not to encumber the site. Place bins away from any building structures to protect against fires.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Burning or burying of rubbish and waste materials on Project Site prohibited. Provide dump box for collection of waste materials.
 - 2. Disposal of volatile fluid wastes (such as mineral spirits, oil or paint thinner) in storm or sanitary sewer systems is strictly prohibited.

- B. Dust Control:
 - 1. Periodically wet down site as required to keep flying dust to minimum. Comply with regulations of state and local jurisdiction.

- C. Progress Cleaning: Comply with requirements specified in Section 017000 "Execution".

- D. Barriers: Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
 - 1. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
 - 2. Provide protection for plants designated to remain. Replace damaged plants.
 - 3. Provide barricades required by governing authorities for work in public right of way.

- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
 - 1. Provide barricades or fencing and maintain same around all trees, shrubs or other landscaped areas adjacent to work of this Contract to protect such areas from damage of any nature caused by construction operations.
 - 2. Replace any plantings damaged or destroyed with plants of equivalent size, type and nature as approved by Architect.

- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations, unless otherwise indicated on Drawings. Coordinate extent with Owner and Architect prior to installing fencing.
 - 2. Construction: Commercial grade chain link fence, unless otherwise indicated.
 - 3. Provide 6-foot high fence. Equip with vehicular and pedestrian gates with locks.
 - a. Provide support blocks and bracing as required to completely stabilize fencing and gates.
 - b. Maintain fencing for duration of construction. Move fencing as required for orderly progression of work; maintain secure enclosure at all times.
 - c. Remove fencing and supports prior to Substantial Completion, when such removal will not create a safety hazard for the public.

- G. Security: Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
1. Identification Badges: The Contractor and its subcontractors, and the employees and the agents of any of them shall comply with District's policies and requirements to obtain, display, and return identification badges at any time while they are present on District's property. All contract personnel shall wear an ID badge that is a distinctive color with the word "Contractor" on the badge. The badge must be worn by any contract personnel within existing buildings. Contractor's Superintendent shall issue badges and maintain process.
 - a. Provide identification badge to each person authorized to enter premises.
 - b. Badge to include personal photograph, name, assigned number, expiration date and employer.
 - c. Maintain a list of accredited persons. Submit copy to Owner on request.
 - d. Require return of badges at expiration of their employment on the Work.
 2. Where materials and equipment must be temporarily stored and are of substantial value, or attractive for possible theft, provide secure lockup.
 3. Enforce strict discipline in connection with the timing of installation and release of materials to minimize the opportunity for theft and vandalism.
 4. Additional Provisions of Owner's Security Program - Contact with Students:
 - a. "Unsupervised contact" with students means contact that provides the person opportunity and probability for personal communication or touch with students when not under direct District supervision.
 - b. As required by ORS 326.603, Contractor shall ensure that Contractor, any subcontractors, and their officers, employees, and agents will have no direct, unsupervised contact with students while on District property.
 - c. Contractor shall work with District to ensure compliance with this requirement. If
 - (1) the work site is not a "closed site" as described below, and (2) Contractor is unable to ensure through a security plan that none of its officers, employees, or agents or those of its subcontractors will have direct, unsupervised contact with students in a particular circumstance or circumstances, then Contractor shall notify District before beginning any Work that could result in such contact.
 - d. Contractor authorizes District to obtain information about Contractor and its history and to conduct a criminal background check, including fingerprinting, of any Contractor officers, employees, or agent who may have unsupervised contact with students. Contractor shall cause its employees and/or subcontractors, if any, to authorize District to conduct these background checks.
 - e. Contractor shall pay all fees assessed by Oregon Department of Education for processing the background check. District may deduct the cost of such fees from a progress or final payment to Contractor under this Contract, unless Contractor elects to pay such fees directly.
 - f. All Contractors and their employees, whether full time or part time, working at closed sites must undergo a criminal history verification for disqualifying convictions per ORS 342.143. Criminal history verification checks will be conducted at the Contractor's expense, by CSD Security Services or an approved third party vendor.
 5. Closed Sites. At District sites that are closed for construction or other purposes, Contractor fingerprinting is not required. However, all contractors and their employees whether full time or part time working at closed sites must undergo a criminal history

verification for disqualifying convictions per ORS 342.143. Criminal history verification checks will be conducted at the Contractor's expense, by CSD Security Services or an approved third party vendor. Prior to entry of a Contractor's employees onto a jobsite, the Contractor shall provide a list of its employees who have successfully undergone the criminal history verification check.

- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Exterior Enclosures: Provide temporary insulated weathertight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Take all precautions to prevent possibility of fire resulting from construction operations. Particularly avoid hazardous accumulations of rubbish and unsecured, flammable materials.
 - 5. Provide emergency fire extinguishing equipment of adequate type and quantity, readily available and properly maintained.
- K. Temporary First Aid Facilities: Provide adequate first aid facilities for construction personnel.

3.4 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping moisture in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.

3.5 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore new permanent facilities used during construction to specified condition.

END OF SECTION 015000

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Seaside School District for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED REQUIREMENTS

- A. Section 311000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 312200 - Grading: Temporary and permanent grade changes for erosion control.
- C. Section 321123 - Aggregate Base Courses: Temporary and permanent roadways.

1.3 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of State of Oregon Erosion and Sedimentation Control Manual.
- C. Best Management Practices Standard: FHWA FLP-94-005.
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Seaside School District will obtain permits and pay for securities required by authority having jurisdiction.
 - 2. Seaside School District will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 2 years.
- G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Seaside School District.
- H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
 2. Prevent tracking of mud onto public roads outside site.
 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Seaside School District.
- I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Seaside School District; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Seaside School District; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- K. Open Water: Prevent standing water that could become stagnant.
- L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- D. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Wood waste, chips, or bark.
 - 2. Erosion control matting or netting.
 - 3. Polyethylene film, where specifically indicated only.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491/D4491M.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 - 4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 - 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
 - 8. Manufacturers:
 - a. BP Amoco, Amoco Fabrics and Fibers: www.geotextile.com
 - b. TenCate: www.tencate.com
 - c. North American Green: www.nagreen.com
 - d. Propex Geosynthetics: www.geotextile.com
- D. Silt Fence Posts: One of the following, minimum 5 feet long:
 - 1. Hardwood, 2 by 2 inches in cross section.
- E. Gravel: See Section 321 123 for aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - c. Along the toe of cut slopes and fill slopes.
 - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
 - e. Across the entrances to culverts that receive runoff from disturbed areas.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet..
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:

1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
 2. Place geotextile fabric full width and length, with minimum 24 inch overlap at joints.
 3. Place and compact at least 8 inches of 2 inch diameter drain rock.
- B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873.
 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 7. Fasten fabric to wood posts using one of the following:
 - a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gauge, 0.083 inch shank diameter.
 - b. Five staples per post with at least 17 gauge, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.

8. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Temporary Seeding:

1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.5 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 015721 - INDOOR AIR QUALITY CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.
- B. Building flush-out after construction and before occupancy.
- C. Testing indoor air quality after completion of construction.

1.2 PROJECT GOALS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
 - 3. Establish condition of existing ducts and equipment prior to start of alterations.
- B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.
- C. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

1.3 RELATED REQUIREMENTS

- A. Section 014000 "Quality Requirements" for testing and inspection services.
- B. Section 016116 "Volatile Organic Compound (VOC) Content Restrictions".

1.4 REFERENCE STANDARDS

- A. ASHRAE Std 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. ASHRAE Std 62.1, Ventilation For Acceptable Indoor Air Quality.

1.5 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.6 SUBMITTALS

- A. See Section 013000 “Administrative Requirements” for submittal procedures.
- B. Indoor Air Quality Management Plan:
 - 1. Describe in detail measures to be taken to promote adequate indoor air quality upon completion; meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).
 - a. Submit not less than 60 days before enclosure of building.
 - b. Identify potential sources of odor and dust.
 - c. Identify construction activities likely to produce odor or dust.
 - d. Identify areas of project potentially affected.
 - e. Evaluate potential problems by severity and describe methods of control.
 - f. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - g. Describe cleaning and dust control procedures.
 - h. Describe coordination with commissioning procedures.
 - 2. Protect stored on-site and installed absorptive materials for moisture damage.

3. If permanently installed air handlers are used during construction, filtration media must be used at each return air grille that meets one of the following criteria below. Replace all filtration media immediately prior to occupancy.
 - a. Filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda).
 - b. Filtration media is Class F5 or higher, as defined by CEN Standard EN 779-2002, Particulate air filters for general ventilation, Determination of the filtration performance.
 - c. Filtration media with a minimum dust spot efficiency of 30 percent or higher and greater than 90 percent arrestance on particle size of 3-10 ug.
- C. Photo Log: Maintain a detailed photo log of the construction IAQ management plan practices followed during construction.
- D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- E. Duct and Terminal Unit Inspection Report.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See Section 016116 "Volatile Organic Compound (VOC) Content Restrictions".
- B. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- C. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE 52.2, with Addenda A through F.

PART 3 - EXECUTION

3.1 CONSTRUCTION PROCEDURES

- A. Meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).
- B. Prevent the absorption of moisture and humidity by adsorptive materials by:
 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.

2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 3. Provide sufficient ventilation for drying within reasonable time frame.
- C. Begin construction ventilation when building is substantially enclosed.
- D. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.
- E. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
- F. HVAC equipment and supply air ductwork may be used for ventilation during construction:
1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
 3. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.
- G. Do not store construction materials or waste in mechanical or electrical rooms.
- H. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
1. Inspect duct intakes, return air grilles, and terminal units for dust.
 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 3. Clean tops of doors and frames.
 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last, after cleaning is complete.
- I. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- J. Replace all filtration media just before occupancy, installing only a single set of final filtration media.
- K. Prohibit smoking inside the building and within 25 feet of building entrances.
- L. Exhaust fumes from idling vehicles and gasoline-fueled tools to the exterior of the building through the use of funnels or temporary piping.
- M. Ventilate using 100 percent outside air (depending on the weather conditions) to exhaust contaminated air directly to the outside during installation of VOC-emitting materials. Depressurizing the work area will allow the air pressure differential between construction and clean areas to contain dust and odors. Provide temporary barriers that contain the construction area.

- N. Institute cleaning activities designed to control contaminants in building spaces during construction and before occupancy. Use vacuum cleaners with high-efficiency particulate filters, increase cleaning frequency and use wetting agents for dust.
- O. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

END OF SECTION 015721

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manufacturer's standard warranties and special warranties.
- B. General product requirements.
- C. Re-use of existing products.
- D. Transportation, handling, storage and protection.
- E. Product option requirements.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

- A. Section 011000 "Summary" for delegated design requirements.
- B. Section 012500 "Product Substitution Procedures" for substitution limitations and procedures.
- C. Section 014000 "Quality Requirements" for product quality monitoring.
- D. Section 016116 "Volatile Organic Compound (VOC) Content Restrictions" for requirements for VOC-restricted product categories.
- E. Section 017419 "Construction Waste Management and Disposal" for recycling and waste disposal requirements potentially affecting packaging and substitutions.

1.3 SUBMITTALS

- A. Proposed Products List: Electronically submit list of major products and list of finish materials proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
 - 3. Indicate product lead times.
- B. Substitution Requests: Submit in accordance with Section 012500 "Product Substitution Procedures".

- C. 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.
- D. 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.
- E. 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.

1.4 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- E. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.
- F. Contractor warrants to the Owner that the materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of material and equipment.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures".

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. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. 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.
- D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
- E. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
 - 1. See Drawings and Section 024119 "Selective Demolition" for list of items required to be salvaged for reuse and relocation.

2.2 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
 - 1. Means new material, machinery, components, equipment, fixtures, and systems comprising the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work.
 - 2. Products may also include existing materials or components when specifically designated for reuse.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 2. Have longer documented life span under normal use.
 - 3. Result in less construction waste.
 - 4. Are made of vegetable materials that are rapidly renewable.

2.3 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Two or more items of the same kind shall be considered identical and by the same manufacturer.
 - 4. Provide products suitable for service conditions.
 - 5. Adhere to equipment capacities, sizes and dimensions shown or specified unless variations are specifically approved in writing.
 - 6. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 7. Where products are accompanied by the term "as selected," Architect will make selection.
 - 8. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

2.4 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 Products of More than One Manufacturer: Use one of the products named and meeting specifications, no options or substitutions allowed.
- D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- E. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Submit a request for substitution for other named manufacturers. Use of manufacturers not named not allowed.
- F. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements for substitutions
- G. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.5 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 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- C. Transport and handle products in accordance with manufacturer's instructions.

- D. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- E. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.2 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store materials in a manner that will not endanger Project structure.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- F. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. 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 016000

SECTION 016116 - DELEGATED DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for delegated design indicated in the various Sections of these Specifications and the drawings.
- B. Section Includes: Structural and other design requirements for delegated design components, otherwise known as fabricator-designed, bidder-designed or bidder design-build components.
- C. This Section applies to Technical Specification Sections, and supplements requirements indicated in the General and Supplementary Conditions and drawings.
- D. Delegated design does not mean deferred submittal. See Drawings for deferred submittals.
- E. Related Requirements: Refer to sections indicated for specific delegated design requirements, including, but not limited to the following:
 - 1. Sports field equipment such as, backstop fencing, barrier net, foul poles, etc. as specified on drawings (plans and calculations as necessary)
 - 2. Pre-fabricated stairs at softball crow's nest (plans and calculations as necessary)
 - 3. Synthetic turf field carpet and infill material (product submittals)
 - 4. MUSCO sports field light (plans and calculations as necessary)

1.2 DEFINITIONS

- A. Contractor Design Requirements: Where occurs, same meaning as Delegated Design Requirements.
- B. Delegated Design Work: Design services and certifications provided by a Professional Engineer registered as such in the State where the Project is located related to systems, materials or equipment required for the Work to satisfy design and performance criteria established by the Contract Documents. Delegated Design does not include professional services the Contractor needs to fulfill their responsibilities under the Contract including but not limited to construction means, methods and sequence.

- C. Seal: Certification that builder design plans, computations and specifications were designed and prepared under the direct supervision of the Architect or Engineer whose name appears thereon.
- D. Approval Stamp: Certification obtained by the Contractor that the Building Official has reviewed a submittal and finds it acceptable with respect to applicable regulatory requirements.
- E. Bidder-Design: Design services provided by an installer or manufacturer complying with quality assurance, performance requirements and design requirements indicated and established by the Contract Documents. Bidder-design does not include Professional Engineering unless indicated otherwise.

1.3 DELEGATED- AND BIDDER-DESIGN SERVICES

- A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in the individual sections.
- B. Where referenced in these specifications, Bidder-Design components and installation shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters specified in this and individual sections.
- C. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.
- D. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 SUBMITTALS

- A. General: Submit complete Delegated Design Submittals to meet permitting agency requirements for permits. Include drawings and calculations for that portion of the Work signed and sealed by a State of Oregon registered engineer. Incomplete submittals or submittals not previously reviewed and so stamped by General Contractor will not be accepted for review by the Architect or Engineer of Record.
- B. These submittal requirements are in addition to other submittal requirements stated elsewhere in the contract documents.

1.5 QUALITY ASSURANCE

- A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this section.
- B. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.

1.6 INSURANCES

- A. Refer to General Conditions for Insurance and Bonds.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 WORK INCLUDED

- A. General: Certain of the components of the Work under this project are Delegated Design. It is the General Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibility for the design, calculations, submittals, fabrication, transportation and installation of the Delegated Design portions or components as required in this Section.
- B. The General Contractor is responsible to submit all documents required by the permitting agency for the separate approval and permit for each Delegated Design item. Delegated Design components of this Work are defined as complete, operational systems, provided for their intended use.
- C. All permit plan review and permit fees for Delegated Design items are the responsibility of the submitting General Contractor.

3.2 DOCUMENTS REQUIRED

- A. General: Delegated Design documents and related permits issuance must be completed prior to fabrication. The General Contractor must complete and submit a Contractor Design Summary

Sheet listing Delegated Design Subcontractors and their registered engineer's names and phone numbers prior to submission of the Delegated Design documents for review.

- B. Scope of Documents: Delegated Design components are shown in the Contract Documents for design intent. The purpose is to have the General Contractor responsible to provide, coordinate and install each Delegated Design component.
 - 1. Delegated Design components attached to the structural frame or supplemental to the structural frame shall be designed for the anticipated loads as outlined in the Contract Documents. These Delegated Design components are all to be coordinated with appropriate subcontractors.
 - 2. Load reactions at the interface between the Delegated Design components and the structural frame shall be clearly defined to allow for a review by the Architect and Engineer of Record.

- C. Component Certification: Certify that mechanical and electrical components comply with the structural provisions of all applicable codes.
 - 1. Shop Drawings: Submit shop drawings for all attachments to the structure for all elements requiring structural design per these specifications. These attachments include, but are not limited to, structural bracing for equipment, conveyances, and architectural components; seismic restraints of vibration isolation systems; and details of lateral bracing and attachment systems designed to accommodate differential movement between building levels.
 - 2. Shop Drawings shall be sealed by the structural engineer responsible for their design.

- D. Quality Assurance Plan: Submit a quality assurance plan for the designated structural system of all elements requiring structural design per these specifications. Quality assurance plan shall comply with Owner's requirements and all applicable codes.

END OF SECTION 016116

SECTION 016119 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. VOC restrictions for product categories listed below under "DEFINITIONS."
- B. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.
- C. Section requirements apply to all Project Work.

1.2 RELATED REQUIREMENTS

- A. Section 013000 "Administrative Requirements" for submittal procedures.
- B. Section 016000 "Product Requirements" for fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- C. Section 016119.01 "Accessory Material VOC Content Certification Form".

1.3 DEFINITIONS

- A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
 - 1. Adhesives, sealants, and sealer coatings.
 - 2. Tiling.
 - 3. Carpet.
 - 4. Resilient flooring and accessories, including resilient base.
 - 5. Resilient athletic flooring.
 - 6. Fluid applied flooring.
 - 7. Wood athletic flooring.
 - 8. Painting and coatings.
 - 9. High-performance coatings.
 - 10. Composite wood and agrifiber products used either alone or as part of another product.
 - 11. Other products when specifically stated in the specifications.
- B. Interior of Building: Anywhere inside the exterior weather barrier.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.4 REFERENCE STANDARDS

- A. CAL (VOC) - Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers (including Addendum 2004-01); State of California Department of Health Services.
- B. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute.
- C. FloorScore Standard; current edition.
- D. GreenSeal GC-03, Anti-Corrosive Paints; Green Seal, Inc
- E. GreenSeal Standard GS-11, Paints and Coatings; Green Seal, Inc.; 1st Edition, May 20, 1993; www.greenseal.org.
- F. GreenSeal GS-36, Commercial Adhesives; Green Seal, Inc.
- G. SCAQMD 1113, South Coast Air Quality Management District Rule No.1113; current edition; www.aqmd.gov.
- H. SCAQMD 1168, South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.5 SUBMITTALS

- A. See Section 01 30 00 “Administrative Requirements,” for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit product data showing evidence of compliance, except when another type of evidence of compliance is required.
- C. Accessory Material VOC Content Certification Form: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.
 - 1. Use the form following this Section for installer certifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Adhesives and Joint Sealants used on the interior of the building (defined as inside the weather-proofing system):
 - 1. Adhesives, sealants and sealant primers shall comply with South Coast Air Quality Management District (SCAQMD) Rule No.1168 effective date of July 1, 2005 and rule

- amendment date of January 7, 2005 or, provide products that meet the testing and product requirements of the State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
2. Aerosol adhesives shall comply with GreenSeal Standard for Commercial Adhesives GS-36 requirement in effect on October 19, 2000 or, provide products that meet the testing and product requirements of the State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
 3. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- B. Paints and Coatings used on the interior of the building (defined as inside the weatherproofing system):
1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 2. Architectural Paints and Coatings: Do not exceed VOC content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993 OR provide products that meet the testing and product requirements of the State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
 3. Anti-Corrosive and Anti-Rust Paints: Do not exceed VOC content limits established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997 OR provide products that meet the testing and product requirements of the State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
 4. Clear Wood Finishes, Floor Coatings, Stains, Primers, Sealers and Shellacs applied to interior elements: Do not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule No. 1113, Architectural Coatings, rules in effect on January 1, 2004 OR provide products that meet the testing and product requirements of the State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
 5. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
 6. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.

- C. Flooring Systems used on the interior of the building (defined as inside the weatherproofing system):
1. Provide flooring systems that comply with the most stringent requirements specified in the following:
 - a. Carpet installed in the building shall meet one of the following requirements:
 - 1) Meets the testing and product requirements of the Carpet and Rug Institute (CRI) Green Label Plus Program.
 - 2) Maximum VOC concentrations are less than or equal to those specified in the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda, using the office scenario as defined in Table 7.5 within the practice. The additional VOC concentration limits listed in Section 9.1a must also be met.
 - 3) Maximum VOC concentrations meet the California requirements specified above based on the following:
 - a) California Department of Public Health (CDPH) Standard Method V1.1-2010 using test results obtained at the 14 day time point.
 - b. Carpet adhesive shall meet the requirements of IEQc4.1 Adhesives and Sealants, which includes a volatile organic compound (VOC) limit of 50g/L.
 - c. Hard surface flooring installed in the building shall meet one of the following requirements:
 - 1) Meet the requirements of the FloorScore standard (current as of the date of the reference rating system - 2009, or more stringent version) as shown with testing by an independent third-party.
 - d. Demonstrate Maximum VOC concentrations are less than or equal to those specified in the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda, using the office scenario as defined in Table 7.5 within the practice.
 - 1) Maximum VOC concentrations meet the California requirements specified above based on the following:
 - a) California Department of Public Health (CDPH) Standard Method V1.1-2010 using test results obtained at the 14 day time point.
 - e. For carpet adhesive, concrete and wood floor finishes, and tile setting adhesives, compliance can be demonstrated with test results of:
 - 1) Total volatile fraction, based on one of the following, provided that water and exempt compounds are subtracted from total volatile test results and the mass VOC content is calculated consistent with SCAQMD Rule 1113 and Rule 1168.
 - a) ASTM D2369.
 - b) EPA method 24.
 - c) ISO 11890 part 1.

- 2) Total volatile organic compounds fraction, based on one of the following, provided that all VOCs with a boiling point up to 280C (536F) are included, and exempt compounds are subtracted from total volatiles test results and the mass VOC content is calculated consistent with SCAQMD Rule 1113 and Rule 1168.
 - a) ASTM D6886.
 - b) ISO 11890 part 2.
 2. OR, flooring elements installed in the building shall meet the testing and product requirements of the State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
 3. Evidence of Compliance: Acceptable types of evidence are:
 - a. Published product data showing compliance with requirements.
- D. Composite Wood and Agrifiber Products used on the interior of the building (defined as inside the weatherproofing system):
1. Provide products having no added urea-formaldehyde resins.
 2. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.

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 016119

SECTION 016119.01 - ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

1.1 FORM

A. Identification:

- 1. Project Name: _____
- 2. Project No.: _____
- 3. Architect: _____

B. Use of This Form:

- 1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
- 2. Contractor is required to obtain and submit this form from each installer of Work on this Project.
- 3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
- 4. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

C. VOC content restrictions are specified in Section 016119 "Volatile Organic Compound (VOC) Content Restrictions".

1.2 PRODUCT CERTIFICATION

A. I certify that the installation work of my firm on this project:

- 1. [HAS] [HAS NOT] required the use of any ADHESIVES.
- 2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
- 3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
- 4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

B. Product data and MSDS sheets are attached.

1.3 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

A. Firm Name: _____

B. Print Name: _____

C. Signature: _____

D. Title: _____(officer of company)

E. Date: _____

END OF SECTION 016119.01

SECTION 017000 - EXECUTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Protection of installed construction.
- C. Correction of the Work.
- D. Progress cleaning.

1.2 RELATED REQUIREMENTS

- A. Section 011000 "Summary" for Owner-furnished work.
- B. Section 014000 "Quality Requirements" for installation layout control, where applicable to Project.

1.3 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.1 QUALITY ASSURANCE

- A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.2 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where applicable, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical, plumbing, fire suppression and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - a. Verify that utility services are available, of the correct characteristics, and in the correct locations.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - a. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings in 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.
- D. Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
- E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- F. Review Contract Documents and field conditions. Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Section 013000 "Administrative Requirements".

3.3 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 and 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.
- J. Provide evidence of completion of clash detection with other trades prior to commencement of work.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
 - 2. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
 - 3. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
 - 4. Make neat transitions between different surfaces, maintaining texture and appearance.
 - 5. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 6. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 7. The Architect may make minor adjustments in fixture, outlet, grille, louver, or ventilator locations prior to rough-in work with no additional cost.

- B. Installer Inspections: Require installer of each major unit of work to inspect substrate and conditions for installation and to report unsatisfactory conditions in writing.
 - 1. Correct unsatisfactory conditions before proceeding with installation.
 - 2. Inspect each product immediately before installation.
 - 3. Do not install damaged or defective products, materials or equipment.
 - 4. Start of installation shall be understood as acceptance of substrate conditions by the installer.

- C. Clearances: Provide adequate clearance between Architectural, Structural, Mechanical and Electrical systems. Verify physical dimensions of equipment and its available space. Check access routes through concealed or existing spaces for installation of systems or equipment.
 - 1. Review the Contract Documents for possible conflicts prior to rough-in. Verify that equipment will fit in the space provided. Resolve conflicts with the Architect prior to rough-in work.

- D. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

- E. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

- F. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

- G. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

- H. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- I. Attachment: Provide blocking, attachment plates, anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hair-line joints.

- K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
- C. Provide and maintain temporary shoring and lateral bracing of structure during erection to resist all loads including:
 - 1. Wind.
 - 2. Seismic.
 - 3. Construction.
 - 4. Materials.
 - 5. Moving equipment.
- D. Do not remove temporary bracing and shoring until adequate, permanent connections or structural elements are in final position and positively anchored.
- E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- G. 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.
- H. Prohibit traffic from landscaped areas.
- I. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- J. Comply with manufacturer's written instructions for temperature and relative humidity.

3.6 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 - 4. Daily cleaning shall include magnetic sweep of jobsite to pick up all nails and metallic debris.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal".
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

- K. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- L. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- M. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION 017000

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood: May be used as blocking or furring.
 - 5. Land clearing debris, including brush, branches, logs, and stumps.
 - 6. Concrete.
 - 7. Bricks.
 - 8. Concrete masonry units.
 - 9. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 10. Glass.
 - 11. Gypsum drywall and plaster.
 - 12. Plastic buckets.
 - 13. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - 14. Asphalt roofing shingles.
 - 15. Paint.
 - 16. Plastic sheeting.
 - 17. Rigid foam insulation.
 - 18. Windows, doors, and door hardware.
 - 19. Plumbing fixtures.
 - 20. Mechanical and electrical equipment.
 - 21. Fluorescent lamps (light bulbs).
 - 22. Acoustical ceiling tile and panels.
 - 23. Roller shades.
 - 24. Reclaimed urban hardwoods from site trees to be removed.

- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
 - 5. Incineration, either on- or off-site.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

- A. Section 013000 “Administrative Requirements” for additional requirements for project meetings, reports, and project documentation.
- B. Section 015000 “Temporary Facilities and Controls” for additional requirements related to trash/waste collection and removal facilities and services.

1.3 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.

- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by the Owner or others, as determined by the Owner.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- Q. Wood Reclaim and Reclamation: To remove a waste material from the project site to another site for resale or reuse by the Owner or others, as determined by the Owner.

PART 2 - PRODUCTS

2.1 RECYCLING AND SALVAGE PROCESSERS

- A. Refer to the Recology Western Oregon recycling page: <https://www.recolgy.com/recology-western-oregon/clatsop/>
- B. Deconstruction Services: Following are acceptable processers; Contractor is not limited to use of these companies.
 - 1. Astoria Transfer Station: www.recolgy.com/recology-western-oregon/clatsop/

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

- A. Refer to Section 013000 “Administrative Requirements” for additional requirements for project meetings, reports, and project documentation.
- A. Refer to Section 015000 “Temporary Facilities and Controls” for additional requirements related to trash/ waste collection and removal facilities and services.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Substantial Completion.
- B. Final Completion.
- C. Punch List.
- D. Warranties.
- E. System startup.
- F. Adjusting.
- G. Final Cleaning.
- H. Maintenance.

1.2 RELATED REQUIREMENTS

- A. Section 017800 "Closeout Submittals": Project record documents, operation and maintenance (O&M) data, warranties and bonds.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting review for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - 1. In progress payment request coincident with or first following date claimed, show either 100 percent completion for portion of work claimed as "substantially complete", or list incomplete items, value of incompleteness, and reasons for being incomplete. Include supporting documentation for completion as indicated in these contract documents.
 - a. Submit statement showing accounting of changes to the Contract Sum.
 - b. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Prepare and submit drafts for Operation and Maintenance Manuals.
 6. Prepare and submit drafts for Project Record Documents.
 7. Prepare and submit damage or settlement surveys, property surveys, and similar final record information. Update to existing survey by qualified land surveyor and include with record drawings.
 8. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable. Submit an itemized receipt, signed by Owner, to Architect.
 9. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner and utility companies of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 15. Make submittals that are required by governing or other authorities.
 - a. Provide copies to Architect and Owner.
 - b. Provide copy of Occupancy Permit to Architect and Owner.
- B. Review: Submit a written request for review for Substantial Completion. On receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after review or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Results of completed review will form the basis of requirements for Final Completion.
 2. Should the Architect have to perform any additional reviews due to failure of Work to comply with claims of completion made by Contractor, the cost for each additional review will be charged to the Owner at the Architect/Engineer's hourly rate. The Owner shall have the right to deduct such charges from the contract amount as provided in the Conditions of the Contract.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final review for determining final completion, complete the following:
1. Submit a final Application for Payment with final waivers according to the Design-Build Contract.
 - a. Submit updated final statement, accounting for additional (final) changes to Contract Sum.

2. Submit consent of surety.
3. Prepare and submit final Project Record Documents within 30 days after date of Substantial Completion or before final completion, whichever occurs first.
4. Submit final warranties.
5. Submit final operation and maintenance manuals.
6. Submit certified copy of Architect's Substantial Completion review list of items to be completed or corrected (punch list). The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
8. Submit permanent unconditioned Certificate of Occupancy.
9. Submit payment and release of liens to requirements of General Conditions. Before final payment, the Contractor shall furnish the following to the Architect:
 - a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner of property might in any way be responsible, have been paid or otherwise satisfied (use AIA Form G706 or approved by District).
 - b. An affidavit from each Subcontractor on AIA Form G706 or approved by District.
 - c. Letter from Bonding Company addressed to Owner but submitted to the Architect, approving release of final payment and waiving submission of final receipts as well as a statement confirming the extension of the Bond for the warranty period as specified. Final receipts from all subcontractors and material and equipment suppliers may be required to furnish to the Owner by the Contractor if the Surety does not waive this requirement. Letters to be in substantially the following form:

[Name of Owner]

Re: [Bond No.]

[Name of Contractor]

[Address]

[Name of Project]

Gentlemen:

The [Name of Bonding Company], surety on the above named Bond, consents to payment of retained percentages and agrees to waive submission of final receipts.

It is also agreed that the final payment to the Contractor shall not relieve the Surety Company of any of its obligations and that the Bond is extended to include guarantees and warranties of workmanship and materials.

[NAME OF BONDING COMPANY]

Attorney-in-Fact

- d. Submit Contractor's Affidavit of Release of Liens (AIA Form G706A or approved by Owner).
- e. Return all copies of the Drawings and Specifications in accordance with the General Conditions.

10. Submit Affidavit of Wages Paid for Contractor and all sub-contractors.
 11. Submit Employment Security Release.
 12. Submit Department of Revenue Release (for projects over \$35,000 only).
 13. Return to Owner all items issued during construction such as keys, security passes and identification badges.
 14. Complete startup testing of systems.
 15. Submit test/adjust/balance records.
 16. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 17. Submit attendance record for training of Owner's personnel.
 18. Complete requirements of Section 01 78 00 "Closeout Submittals".
- B. Review: Submit a written request for final review for acceptance. On receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. Architect will either prepare a letter to Owner recommending final acceptance or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Additional Reviews: Request an additional review when the Work identified in previous reviews as incomplete is completed or corrected.
 2. Should the Architect have to perform any such additional reviews due to failure of Work to comply with claims of completion made by Contractor, the cost for each additional review will be charged to the Owner at the Architect/Engineer's hourly rate. The Owner shall have the right to deduct such charges from the contract amount as provided in the Conditions of the Contract.
 3. Provide additional cleaning services as required for Work which was not complete at the time of initial review. Reclean as required until all Work is fully complete and recommended for final acceptance by Architect.
 4. If the Work does not achieve Final Completion within two weeks of the date originally scheduled to do so, plus any time adjustments by Change Order, the Architect's time and efforts beyond that period shall constitute extra services, the cost of which at the Architect's standard hourly rates will be deducted from the Contractor's Final Payment or retainage by the Owner.
 5. Punch list items in the Schedule of Values will be released on any given line item only when all punchlist items relating to that line item are satisfactorily completed.

1.5 CONTRACTOR'S LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Prior to requesting review for Substantial Completion, perform a thorough punch list of the project identifying incomplete items, damaged items and substandard items requiring correction.
1. Distribute the Punch List to applicable subcontractors and indicate corrections made to each item.
 2. Reinspect and sign off on all complete items.
 3. This Punch List will form the basis of the list to be submitted with the request for Substantial Completion.
 4. Supplement Punch List with valuation of incomplete items and reasons for being incomplete.
 5. Prepare Punch List in digital format acceptable to Architect.

- B. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. Portable Document Format (PDF)-type file.

1.6 WARRANTIES

- A. Submittal Time:
 - 1. Submit summary of warranties included in the bid within seven days after Notice of Intent to Award Contract (Prior to Execution of the Contract). Indicate duration of each warranty and start date.
 - 2. Submit sample warranties as part of the project submittal process.
 - 3. Submit final warranties before requesting review for final acceptance.
- B. Comply with requirements of Section 017800 "Closeout Submittals".

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 SYSTEM STARTUP

- A. Coordinate schedule for start-up and functional testing 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 and manufacturer's representative in accordance with manufacturers' instructions.
- G. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units and retest.
- H. 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.
- I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.2 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.3 CLEANING PRIOR TO SUBSTANTIAL COMPLETION REVIEW

- A. At time of project close-out, clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program.
- B. Complete the following cleaning operations before requesting the Architect's review for certification of Substantial Completion.
 - 1. Remove grease, dust, dirt, stains, manufacturer's labels, fingerprints, etc. from sight exposed surfaces.
 - 2. Remove non-permanent protection and labels.
 - 3. Wash and polish all interior and exterior glazing and mirrors.
 - 4. Repair, patch and touch-up marred surfaces.
 - 5. Clean heating and cooling ducts, blowers, coils, fixtures, equipment, piping, and grilles.
 - 6. Replace disposable air filters and clean permanent filters.
 - 7. Remove construction debris.
 - 8. Flush water systems and disinfect domestic water lines. Sanitize plumbing and food service facilities.
 - 9. Broom clean new exterior paved surfaces and walks. Vacuum clean interior carpeted surfaces and wet mop hard floor surfaces.
 - 10. Clean light fixtures and replace burned-out lamps and replace damaged lenses.
 - 11. Police yards and grounds.

3.4 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and anti-pollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting review for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. 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.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. 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.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grilles.

- q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
2. Maintain in cleaned condition until Final Completion or Owner occupancy.

3.5 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 017700

SECTION 017800 - CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Manuals.
- C. Warranties and bonds.

1.2 RELATED REQUIREMENTS

- A. Section 013000 "Administrative Requirements": Submittals procedures, shop drawings, product data, and samples.
- B. Section 017700 "Closeout Procedures": Contract closeout procedures.
- C. Individual Specification Sections: Specific requirements for operation and maintenance data.
- D. Individual Specification Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

- A. Record Drawings:
 - 1. Draft: Submit one copy of marked-up record prints in electronic color PDF format prior to request for review for Substantial Completion.
 - 2. Final: Submit an electronically scanned copy of marked up prints within thirty (30) calendar days of dated established for Substantial Completion or prior to request for review for final completion, whichever occurs first.
 - 3. Approved permit set of plans.
 - 4. Provide all electronic files and documents required by the BIM Execution Plan.
- B. Record Specifications:
 - 1. Draft: Submit one copy of marked-up copy of Project Manual in electronic color portable document format (PDF) type file prior to request for review for Substantial Completion.
 - 2. Final: Submit one electronically scanned marked-up copy of Project Manual within thirty (30) calendar days of date established for Substantial Completion or prior to request for review for final completion, whichever occurs first.

- C. Operation and Maintenance Manuals:
1. Draft: Submit one copy of draft manuals in electronic color PDF format prior to request for review for Substantial Completion. Architect will review draft and return one copy with comments. Revise content of all document sets as required prior to final submission.
 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. Final: Submit an electronically scanned copy in final form prior to request for review for final completion.
- D. 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. Draft: Submit as part of normal submittal process.
 3. Final: Submit final forms of warranties prior to request for review for final completion.
- E. PDF Format: Submit searchable hyper-linked PDF electronic files. File names shall clearly identify the Owner, project name, drawing or specification number and name and date. File name shall be established to list in the same order as identified in the Contract Documents.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 PROJECT RECORD DOCUMENTS

- A. Maintain on-site one (1) complete set of the following record documents; record actual revisions to the Work:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and Construction Change Directives.
 5. ASIs and responses to RFIs.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
 7. Architect will provide one hard copy (if applicable) and one hyper-linked PDF electronic file of a conformed set of Contract Documents (both drawings and specifications), that have been extracted directly from the Revit model incorporating addenda for use by Contractor in developing and maintaining Record Drawings.
 - a. Architect will provide initial linking of the PDF including at a minimum:
 - 1) Hyperlinked Table of Contents for both drawings and specifications.
 - 2) Bluebeam Studio (or approved other) initiated for use by project teams.

- B. The record documents shall include all disciplines of work whether changes occur or not. These documents, as well as the approved permit set of plans, shall be available to the Architect and Owner at the site and reviewed with them on a monthly basis. The record documents will be maintained by the Contactor and shall incorporate all updates from Subcontractors and their scope of work. Satisfactory maintenance of up-to-date record drawings on a monthly basis will be a requirement for approval of progress payments.
- C. The dynamic PDF will be used as the most current and up-to-date approved set of documents for access by the entire project team.
- D. Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.
- E. Record Drawings: Once received, continue to hyperlink the drawings and specifications to include at a minimum:
 - 1. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Addenda.
 - k. Changes made by Change Order or Construction Change Directive.
 - l. Changes made following Architect's written orders, including ASIs and responses to RFIs.
 - m. Details not on the original Contract Drawings.
 - n. Field records for variable and concealed conditions.
 - 1) Include pre-cover photographs of every room and include link to the dynamic PDF.
 - o. Record information on the Work that is shown only schematically.
 - p. Drawing details linked within drawings, all building section details and other details will be linked within the interactive PDF to allow easy navigation.
 - 2. Record drawings shall include, as a minimum, the location and performance data on each piece of equipment, detailed configuration of duct and pipe distribution system, including sizes, and the terminal air and water design flow rates updated to show approved balancing of systems.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record

- prints. Bluebeam Studio, or approved other, shall be utilized for collaboration and approval of marked-up record documents.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Mark revisions and/or clarifications issued by Addenda, ASI, Construction Change Directive, Change Orders or responses to RFIs to reflect the change. Each such revision shall be graphically depicted to represent physical construction and clearly noted with the applicable Addenda, ASI, Change Order or RFI number. Notation of the Addenda, RFI, ASI, Construction Change Directive or Change Order number alone will not be acceptable. All originating documents shall be linked and accessible within the dynamic PDF drawings.
 7. Ensure entries are complete and accurate, enabling future reference by Owner.
 8. Scanned Drawings: After review of draft drawings by Architect, incorporate necessary changes and prepare a full set of scanned Contract Drawings and Shop Drawings on CD-ROM.
- F. Specifications: Legibly mark and record at each product section a description of actual products installed, including the following:
1. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 2. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 3. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals.
 4. Mark revisions and/or clarifications issued by Addenda, ASI, Construction Change Directive, Change Orders or responses to RFIs to reflect the change. Each such revision shall be graphically depicted to represent physical construction and clearly noted with the applicable Addenda, ASI, Change Order or RFI number. Notation of the Addenda, RFI, ASI, Construction Change Directive or Change Order number alone will not be acceptable.
 5. Format: Submit record Specifications as approved record PDF electronic file(s) of the Specifications.

3.2 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Sub-contractors 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.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
 - 2. Product data, with catalog number, size, composition, and color and texture designations.
 - 3. 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.
- C. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- D. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- E. Additional information as specified in individual product specification sections.
- F. 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.

3.4 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. 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.

- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- M. Include test and balancing reports.
- N. Additional Requirements: As specified in individual product specification sections.
- O. Hold several meetings with Owner, Architect and Contractor to determine Operations and Maintenance (O&M) data to be included and linked to the dynamic PDF.

3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into electronic copies 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 electronic "folders" for each system.
- C. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- D. Tables of Contents: List every item separated by a folder, 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.
- E. Text: Manufacturer's printed data.
- F. Drawings: Provide with reinforced punched binder tab. Bind in with text. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

- G. 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.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.
 4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.
- H. PDF Electronic File: After review of draft manuals, assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.
1. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
 2. Enable inserted reviewer comments on draft submittals.
 3. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.
 4. Incorporate O&M data to be included and linked to the dynamic PDF.

3.6 WARRANTIES AND BONDS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
 2. The Owner reserves the right to refuse to accept or pay for Work for the Project where a Special Warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.
- E. 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 the Date of Substantial Completion is determined.
- F. Verify that documents are in proper form and contain full information.
- G. Co-execute submittals when required.
- H. Retain warranties and bonds until time specified for submittal.
- I. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- J. 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.
- K. 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.
1. Product or work item.
 2. Installer of product or item, with name of principal, address, and telephone number.
 3. Describe the work provided by this installer/Subcontractor, under this Contract.
 4. Date of beginning of warranty or service and maintenance contract. (See General Condition's Warranty paragraph.)
 5. Duration of warranty or service maintenance contract.
 6. Information for Owner's personnel, including:
 - a. Proper procedure in case of failure.
 - b. Contact phone numbers of manufacturer.
 7. Instances that might affect validity of warranty or bond.
 8. Contractor, name of responsible principal, address, and telephone number.

- L. Schedule of Warranties: Provide a summary schedule of start and end date of each warranty.
- M. 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 017800

SECTION 017900 - DEMONSTRATION AND TRAINING

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. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Conveying systems.
 - 6. Landscape irrigation.
 - 7. Common Areas access control.
 - 8. Parking Areas access and revenue controls.
 - 9. Other components where indicated in individual product Sections.
- 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 and ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Other components where indicated in individual product Sections.
- D. Related Requirements:
 - 1. Section 017800 "Closeout Submittals": Operation and maintenance manuals.
 - 2. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

- A. See Section 013000 "Administrative Requirements," for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.

3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2016 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
1. Submit to Commissioning Authority for review and inclusion in overall training plan.
 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. Provide in electronic Portable Document Format (PDF) as well, on USB storage device.
- D. Training Videos: Record video of each training session and provide a training video for each attendee for their training session; allow for minimum of two attendees per training session.
1. Provide in one of the following video formats, or other supported by Google YouTube; www.support.google.com/youtube.
 - a. Audio Video Interleaved/ AVI (.avi).
 - b. ISO/IEC Moving Picture Experts Group/ MPEG-4 (.mp4).
 - c. Program stream/ MPEGPS (.mpg).
 - d. QuickTime/ MOV (.mov).
 - e. Windows Media Video/ WMV (.wmv).

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. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. 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.
- E. 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. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

- E. Provide training in minimum two-hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. 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.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and videos, 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 and videos.
- I. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals and videos.
 - 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.
- J. 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 017900

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Engineering Survey: Submit engineering survey of condition of building.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control. Indicate proposed locations and construction of barriers.
- C. Schedule of selective demolition activities with starting and ending dates for each activity.
- D. Predemolition photographs or video.

1.5 CLOSEOUT SUBMITTALS

- A. Inventory of items that have been removed and salvaged.

1.6 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. Furniture
 - b. Equipment
 - c. Plumbing fixtures
 - d. Swinging doors
 - e. Casework
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.
- G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- C. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 4. Maintain fire watch during and for at least half an hour after flame-cutting operations.
 - 5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 6. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 CLEANING

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 033500 "Concrete Finishing"

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

- a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

7. Vapor retarders.
8. Liquid floor treatments.
9. Curing materials.

10. Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.

3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

- C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
- D. Preconstruction Test Reports: For each mix design.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M).

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

- 1. Portland Cement: ASTM C150/C150M Type I.
- 2. Fly Ash: ASTM C618, Class C or F.
- 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

- 1. Alkali-Silica Reaction: Comply with one of the following:

- a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
- b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
- c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301 (ACI 301M).

- 2. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.

- 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Air-Entraining Admixture: ASTM C260/C260M.

- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

- 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
- 2. Retarding Admixture: ASTM C494/C494M, Type B.
- 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
- 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

- E. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.04; 15 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- C. Curing Paper: 8-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- D. Water: Potable or complying with ASTM C1602/C1602M.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Floor Slab Protective Covering: 8-feet- (2438-mm-) wide cellulose fabric.

2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
 - 4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.

- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.2 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.

3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

3.3 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
 2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1 inch (25 mm).
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
 - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
 - b. Remove projections larger than 1/4 inch (6 mm).
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 (ACI 117M) Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view.
3. ACI 301 (ACI 301M) Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.

- b. Remove projections larger than 1/8 inch (3 mm).
- c. Patch tie holes.
- d. Surface Tolerance: ACI 117 (ACI 117M) Class A.
- e. Locations: Apply to concrete surfaces exposed to public view.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING FLOORS AND SLABS

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

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, or another thin-film-finish coating system.
7. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3 mm).

- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.8 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.

4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:
 1. Begin curing immediately after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.

- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.

3.9 TOLERANCES

- A. Conform to ACI 117 (ACI 117M).

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than 28 days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 - 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.

- 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure two sets of two 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.
 - b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
 - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests:
 - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 033500 – CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies curing compounds for interior and exterior concrete surfaces.

1.2 RELATED SECTIONS

- A. Section 033000 – Cast in Place Concrete

1.3 REFERENCES

- A. American Society for Testing and Materials:
 1. ASTM C-309 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
 2. ASTM C-1315 – Standard Specification for Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013300 – Submittal Procedures
 1. Product Data: Manufacturer's literature to include surface preparation, application instructions, recommendations and storage and handling requirements.
 2. Test Data: Confirm compliance and performance with specified requirements.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Applicator must have prior experience applying specified product or similar products, or have manufacturer's representative on site ensuring that preparation and application are performed correctly.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Materials must be delivered in original, factory sealed containers with the manufacturer's labels including product name and batch numbers.
- B. Store in cool dry area. Protect from freezing.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Conditions: Do not apply material when temperature is below 45°F (7°C) or when temperature is expected to fall below 45°F within 48 hours.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturer: US MIX Co., 112 South Santa Fe Drive, Denver, CO 80223, 800-397-9903, <http://www.usspec.com>.

2.2 MATERIALS

- A. Concrete Sealing Compound:
 - 1. US SPEC CS-25-1315
 - 2. Type: Solvent-based, non-yellowing, VOC compliant, concrete sealing compound with acrylic polymers.
 - 3. Compliance: ASTM C-309, Type I, Class B, ASTM C-1315 Type I, Class A. Minimum 25% solids content. Must be VOC compliant in accordance with EPA 40 CFR Part 59.
- B. Slip-Resistant Treatment
 - 1. Apply slip-resistant finish on floor surfaces in Dugouts and Restrooms.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive sealing compound. Notify Engineer if surfaces are unacceptable. Do not begin application until unacceptable conditions are corrected.

3.2 APPLICATION

- A. Apply sealing compound to concrete surfaces at a uniform rate in accordance with manufacturer's instructions.
- B. Do not apply to concrete receiving toppings, epoxy coatings, urethane coatings, or epoxy adhesives.
- C. Do not dilute curing and sealing compound.

3.4 PROTECTION

- A. Protect surfaces from traffic until sealing compound has dried.

END OF SECTION 033500

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Decorative concrete masonry units.
3. Pre-faced concrete masonry units.
4. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include data on material properties, material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost

or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
 - 1. Where fire-resistance-rated construction is indicated, units are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
 - 2. Density Classification: Normal weight.
- C. Pre-faced CMUs: Normal weight hollow concrete units complying with ASTM C90, with manufacturer's standard smooth resinous facing complying with ASTM C744.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
 - 2. Size: Manufactured with pre-faced surfaces having 1/16-inch- (1.5-mm-) wide returns of facing to create 1/4-inch- (6.5-mm-) wide mortar joints.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.

- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
- E. Aggregate for Mortar: ASTM C144.
 - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Aggregate for Grout: ASTM C404.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- H. Water: Potable.

2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Exterior Walls: Hot-dip galvanized carbon or stainless steel.
 - 2. Wire Size for Side Rods: 0.148-inch (3.77-mm).
 - 3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 4. Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.
 - 5. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.
 3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.060-inch- (1.52-mm-) thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.
 2. Copper: ASTM B370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. (4.9-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick or ASTM B370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. (3.7-kg/sq. m) weight or 0.0162 inch (0.41 mm) thick.
 3. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
 4. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 5. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
 6. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
- B. Flexible Flashing: Use one of the following unless otherwise indicated:

2.7 MASONRY-CELL FILL

- A. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Lightweight-Aggregate Fill: ASTM C331/C331M.

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. For exterior masonry, use portland cement-lime or masonry cement mortar.
 - 3. For reinforced masonry, use portland cement-lime or masonry cement mortar.
 - 4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For reinforced masonry, use Type S.
 - 2. For mortar parge coats, use Type S.
 - 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 4. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 - 3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm as measured in accordance with ASTM C143/C143M).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets.

Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-CELL FILL

- A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet (6 m).

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.
- B. Inspections: Special inspections in accordance with Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140 for compressive strength.
- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.
- F. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content and compressive strength.
- G. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.
- H. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at seven days and at 28 days.

3.10 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.

1.2 PREINSTALLATION MEETINGS

- #### A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. Anchor rods.
3. Threaded rods.
4. Shop primer.
5. Shrinkage-resistant grout.

- #### B. Shop Drawings: Show fabrication of structural-steel components.

1.4 INFORMATIONAL SUBMITTALS

- #### A. Welding certificates.
- #### B. Mill test reports for structural-steel materials, including chemical and physical properties.
- #### C. Source quality-control reports.
- #### D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- #### A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- #### B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
 - 2. ANSI/AISC 360.
- B. Connection Design Information:
 - 1. Connection designs have been completed and connections indicated on the Drawings.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
- B. Welding Electrodes: Comply with AWS requirements.

2.3 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
 - 1. Configuration: Hooked.
 - 2. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.
- B. Threaded Rods: ASTM A36/A36M
 - 1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C

2.4 STEEL FINISHES

- A. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer
- B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." SSPC-SP 3, "Power Tool Cleaning." Requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- D. All powder coated metals shall be black.

2.5 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

2.7 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 4. Galvanized surfaces unless indicated to be painted.
 - 5. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 - 1. SSPC-SP 2.
 - 2. SSPC-SP 3.
- C. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 - 2. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - b. Ultrasonic Inspection: ASTM E164.
 - c. Radiographic Inspection: ASTM E94/E94M.
 - 3. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

3.3 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 1. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 2) Ultrasonic Inspection: ASTM E164.
 - 3) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

SECTION 055100 – METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled aluminum stairs and treads.
2. Aluminum railings and guards attached to aluminum stairs.
3. Aluminum handrails attached to walls adjacent to aluminum stairs.

1.2 COORDINATION

- A. Coordinate installation of anchorages for aluminum stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate delivery and installation of stair treads with stair frame fabricator and contractor.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Warranty Statement.
2. Product specifications
3. Engineering: Professional Engineering sealed drawings

B. Shop Drawings:

1. Detailed shop drawings including:
 - a. Overall layout dimensions
 - b. Elevations
 - c. Sections
 - d. Details
 - e. Attachment to other work
 - f. Detailed shop weldment drawings
 - g. Footer layout drawings
2. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

- C. Delegated-Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Aluminum."
- B. All exposed surfaces shall be free of sharp or jagged surfaces.
- C. Warranty that warrants its products to be free from defects in material and workmanship for a period of two years beginning at the date of delivery of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Upside Innovations
 - 2. Saferack
- B. Substitutions: As approved per architect prior to bid date.
- C. Requests for substitutions will be considered in accordance with provisions of Section 016000 - Product Requirements.

2.2 MATERIALS

- A. All Platforms, Steps, Legs, and Guardrails are constructed of mill finish aluminum extrusions and mill finish aluminum sheet. Extrusions are either, 6061-T6, 6063-T52, or 6005-T5 aluminum alloy and all aluminum sheet is 5052-H32.
- B. Mechanical Fasteners: Aluminum, stainless steel or other non-corrosive materials compatible with aluminum members, trim, hardware, anchors and other components of the modular system

2.3 PLATFORMS & LANDINGS

- A. Walking surfaces shall be designed to carry a uniform live load of 100 pounds per square foot and a concentrated vertical load of 300 pounds in an area of one square foot.
- C. Walking surfaces shall be designed to have a coefficient of friction no less than 0.50 in all directions of travel.
- D. Walking surfaces shall be designed and constructed to be continuous, without gaps and shall be made using 1-1/2" x 8" extruded decking. The outside legs of each piece of extrusion should be touching the adjacent piece in order to create a hard stop for structural support.

2.4 PLATFORM LEGS

- A. All legs shall be designed to support the steps and platforms / landings.
- B. When needed, aluminum angles shall be used for cross-bracing platform legs.

2.3 STAIRS

- A. Stair treads and stringers shall be designed to carry a uniform live load of 100 pounds per square foot and a concentrated vertical load of 300 pounds in an area of one square foot.
- B. All stair treads shall have a uniform depth of 11" minimum per step.
- C. All stair risers shall have a uniform height of 7" maximum and shall be closed between treads.
- D. All stair nosings shall have a uniform radius of not less than 1/16" but not more than 9/16" and an underside angle of not more than 30 degrees from the vertical.

2.5 RAILING

- A. All stair rails shall be designed to withstand a concentrated load of 200 pounds applied in any direction on the top of the rail.
- B. Stair rails for steps with a vertical rise over 30" shall have a 42" guardrail in addition to the 36" handrail.
- C. All baluster panels and other custom rail panels shall be designed to withstand a load of 50 pounds in the horizontal direction applied in an area of one square foot.
- D. Guardrails shall not allow a 4" diameter sphere to pass through in any area.
- E. Railing shall be provided on both sides of the stair.
- F. All stair handrails shall be designed to be continuous along stair runs and in between the inside corner of 90 degree and 180 degree turns in stair direction. Handrails shall not be interrupted by posts or other obstructions.

- G. All handrails have a minimum clearance of 1-1/2" between the handrail and the guardrail.
- H. Handrails shall be designed to be 36" high measured vertically from the top of the step nosing to the top of the rail.
- I. Handrails shall extend 12" past the top stair nosing parallel to the ground surface and return to the closest rail post or wall. Handrails shall also extend one tread width past the bottom step tread (11") and return to the closest rail post or wall.

2.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, railings, and guards including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
 - 3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.5 METALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
- B. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, and guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Assemble stairs, railings, and guards in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded joint with some undercutting and pinholes okay.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 - 2. Locate joints where least conspicuous.
 - 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - 4. Provide weep holes where water may accumulate internally.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPERATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Conceal bolts and screws whenever possible.
- D. All legs should land on a solid surface.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Wood furring.
5. Wood sleepers.
6. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
1. Boards: 19 percent.
 2. Dimension Lumber: 19 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.
 3. Timber: 19 percent.
- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions by Grade: Construction or No. 2 grade.

1. Application: All interior partitions.
2. Species:
 - a. Douglas Fir.

B. Framing Other Than Non-Load-Bearing Partitions by Grade: No. 2 grade.

1. Application: Framing other than interior partitions.
2. Species:
 - a. Douglas fir-larch (north); NLGA.

2.4 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20.0 MPa) for 6-inch nominal- (286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi (13 700 MPa)

2.5 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
 - 1. Northern species; No. 2] Common grade; NLGA.
 - 2. Western woods; Construction or No. 2 Commongrade; WCLIB or WWPA.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or Type 304 stainless steel.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

2.8 METAL FRAMING ANCHORS

- A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- D. Install shear wall panels to comply with manufacturer's written instructions.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.

3.2 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.2 ACTION SUBMITTALS

A. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: 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.

1.4 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET MANUFACTURERS

2.2 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
- B. Architectural Woodwork Standards Grade: Custom

- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade VGS.
 - 4. Edges: Grade VGS 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels
- G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued dovetail joints.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
 - 2. Particleboard (Medium Density): ANSI A208.1, Grade M-2.
 - 3. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction as determined by testing performed on identical products by a qualified testing agency.
1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2.5 CABINET HARDWARE AND ACCESSORIES

- A. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
1. Semiconcealed Hinges for Flush Doors: ANSI/BHMA A156.9, B01361.
 2. Semiconcealed Hinges for Overlay Doors: ANSI/BHMA A156.9, B01521.
- B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 100 degrees of opening, self-closing.
- C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter, 2-1/2 inches (63.5 mm) deep
- E. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141 Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: ANSI/BHMA A156.9, B04013; metal
- G. Drawer Slides: ANSI/BHMA A156.9.
1. Standard Duty (Grade 1 and Grade 2): [Side mount] [Undermount][and extending under bottom edge of drawer].
- H. Door Locks: ANSI/BHMA A156.11, E07121.
- I. Drawer Locks: ANSI/BHMA A156.11, E07041.
- J. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.
- K. Grommets for Cable Passage: 1-1/4-inch (32-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Color: Black.

- L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
- M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.6 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips. No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

END OF SECTION 064116

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Trowel Coats: ASTM D1227, Type II, Class 1.
- B. Fibered Brush and Spray Coats: ASTM D1227, Type II, Class 1.
- C. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D1668/D1668M, Type I.
- D. Patching Compound: As recommended in writing by dampproofing manufacturer.
- E. Protection Course: ASTM D6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.
 - 1. Thickness: Nominal 1/8 inch.

2. Adhesive: Rubber-based solvent type recommended in writing by waterproofing manufacturer for protection course type.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
 1. Apply dampproofing to provide continuous plane of protection.
 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing interior face of above-grade, exterior concrete walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

3.3 PROTECTION COURSE INSTALLATION

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
- B. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

3.4 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071113

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet Waterproofing: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Physical Properties:

- a. Tensile Strength, Membrane: 250 psi minimum; ASTM D412, Die C, modified.
- b. Ultimate Elongation: 300 percent minimum; ASTM D412, Die C, modified.
- c. Low-Temperature Flexibility: Pass at minus 20 deg F ASTM D1970/D1970M.

- d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C836/C836M.
 - e. Puncture Resistance: 40 lbf minimum; ASTM E154/E154M.
 - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F ASTM D570.
 - g. Water Vapor Permeance: 0.05 perm maximum; ASTM E96/E96M, Water Method.
 - h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D5385.
2. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.2 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

3.2 INSTALLATION OF MODIFIED BITUMINOUS SHEET-WATERPROOFING

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F

END OF SECTION 071326

SECTION 071900 – WATER REPELLENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water repellents applied to the following surfaces:
 - 1. Exterior concrete masonry.
- B. Graffiti-resistant coatings applied over water repellents at all exterior locations indicated to receive water repellents.
- C. Pressure washing.

1.02 REFERENCE STANDARDS

- A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- B. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films.
- C. ASTM D6490 - Standard Test Method for Water Vapor Transmission of NonFilm Forming Treatments Used on Cementitious Panels.
- D. ASTM D6578/D6578 - Standard Practice for Determination of Graffiti Resistance.
- E. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry.

1.03 PERFORMANCE REQUIREMENTS

- A. Performance Requirements for Exterior CMU:
 - 1. No change in surface texture, no blotchy appearance.
 - 2. ASTM C140/C140M - 24-hour submersion test: 99.7 percent reduction in water absorption.
 - 3. ASTM C642 - 24-hour immersion: 97.5 percent effective.
 - 4. ASTM D1653: 72.5 g/sq ft/24 hours - 100 percent breathable.
 - 5. ASTM E514/E514M:
 - a. 100 percent reduction in leakage rate over the control wall.
 - b. Control wall must have a leakage rate of at least 0.01 liters/hours.
- B. Performance Requirements for Graffiti-Resistant Coatings:
 - 1. Cleaning Cycles: Non-sacrificial, minimum 8 to 10 cleanings cycles without reapplication.
 - 2. ASTM D6490: 90 percent breathable.
 - 3. ASTM D6578/D6578: Cleanability Level of 3 after 25 cycles.
 - 4. Surface Appearance: No appreciable difference compared to non-coated surface.
 - 5. Ultraviolet light stability.

1.04 PREINSTALLATION CONFERENCE

- A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Statement of Compatibility: Manufacturer's statement of compatibility of water repellent with graffiti-resistant coating.
- H. Pre-application Field Test Reports: Results of RILEM uptake tests for water repellents and for graffiti-resistant coatings.
- I. Warranty: Special warranties specified in this Section.
- J. Maintenance Data: Include procedures for stain removal, repairing surface, and cleaning.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.
 - 1. Provide products for water repellents and graffiti-resistant coatings by a single manufacturer.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience and approved by manufacturer
- C. Test Application: Apply a finish sample for each type of water repellent and substrate required and of graffiti-resistant coating. Duplicate finish of approved sample. Test area for RILEM uptake test(s) can serve as finish samples.
 - 1. Locate each test application as directed by Architect.
 - 2. Size: 9 sq. ft. minimum.
 - 3. Final approval by Architect of water-repellent and graffiti-resistant coating application will be from test applications.
 - 4. Conduct RILEM test(s) to comply with requirements specified in Field Quality Control Article.

1.07 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
- C. Do not proceed with application on materials if ice or frost is covering the substrate.

- D. Do not proceed with the application of materials in rainy conditions or if heavy rain is anticipated within 4 hours after application.
- E. Sealer Coordination: Verify compatibility with curing compounds, patching materials, repair mortar, paints, sealants, and similar items to be used on substrates to verify compatibility with the water repellents and graffiti-resistant coatings.

1.09 WARRANTY

- A. Special Warranty for Water Repellents: Manufacturer's standard form in which manufacturer agree(s) to repair and replace materials that fail to maintain water repellency specified within specified warranty period.
 - 1. Loss of Water Repellency:
 - a. Concrete Masonry Units: 1.0 ml/20 minutes or greater (60 mph wind driven rain equivalent) using a water uptake tube meeting the requirements of RILEM Method II.4.
 - 2. Warranty Period: Ten years from date of Substantial Completion.
- B. Special Warranty for Graffiti-Resistant Coatings: Manufacturer's standard form of single source performance warranty in which manufacturer and Applicator agree(s) to repair and replace materials that fail to meet performance requirements specified within specified warranty period.
 - 1. All defective areas shall be retreated by the system manufacturer.
 - 2. Reseal areas where coating effectiveness does not meet the specified limits.
 - 3. Warranty Period: Ten years from date of Substantial Completion or 8 removal cycles, whichever occurs first.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 100 Percent Active Silane Water Repellents:
 - 1. Evonik Industries: www.protectosil.com. (Basis-of-Design)
 - 2. PROSOCO, Inc: www.prosoco.com.
- B. Graffiti-Resistant Coatings:
 - 1. Evonik Industries: www.protectosil.com. (Basis-of-Design)
 - 2. PROSOCO, Inc: www.prosoco.com.
- C. Substitutions: See Section 016000 - Product Requirements.
 - 1. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products. Acceptance of substitution requests will be determined based on mock-up, including RILEM uptake test results and cleanability of surfaces after graffiti application.

2.02 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: One.
 - 3. Maintains dry appearance when wetted.

4. Exterior Products: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - a. Basis-of-Design Products:
 - 1) Exterior Unpainted CMU:
 - (b) Evonik Industries; Protectosil CHEM-TRETE PB 100.
 - (c) PROSOCO; Blok-Guard & Graffiti Control Ultra.
 - B. Graffiti-Resistant Coatings: Waterborne, low-VOC, fluorosilane-based non-sacrificial antigraffiti treatment.
 1. VOC Content: Less than 100 grams per liter.
 2. Products:
 - a. Evonik Industries; Protectosil ANTIGRAFFITI.
 - b. PROSOCO; Sure Klean Weather Seal Blok-Guard & Graffiti Control Ultra.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.
- D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION FOR WATER REPELLENT APPLICATION

- A. Protection of Adjacent Work:
 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Do not start work until concrete substrate is cured a minimum of 60 days.
- D. Remove loose particles and foreign matter.
- E. Verify that masonry joints found to be unsound, hollow or otherwise defective have been raked out to a depth of 1/2-inch and pointed with mortar.
- F. Verify that cracks that exceed 1/64-inch wide have been filled with pointing mortar.
- G. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- H. Coordination: Verify compatibility of water repellent and graffiti-resistant coatings with curing compounds, patching materials, repair mortar, paints, sealants, etc. to be used on or adjacent to surfaces to be coated.
- I. Scrub and rinse surfaces with water and let dry.
- J. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 WATER REPELLENT APPLICATION

- A. Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.
- B. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- C. Apply at rate recommended by test application, continuously over entire surface.
- D. Apply one coat, minimum.
- E. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.
- F. Provide manufacturer's field service representative to inspect preparation and application work for at least 3 hours on first day to ensure that manufacturer's "best practices" for preparation and application are being followed.

3.04 PREPARATION FOR GRAFFITI-RESISTANT COATING APPLICATION

- A. Surface Preparation:
 - 1. Clean surfaces to receive coating of dirt, oil, graffiti, grease, laitance, and other contaminants. Clean all other surfaces by mid-pressure water (1500 psi) when required or recommended by manufacturer.
 - 2. Remove dirt, dust and materials that will interfere with the proper and effective application of the graffiti-resistant coating. Prepare the surfaces as recommended by the graffiti-resistant manufacturer.
 - 3. Check the compatibility of all sealants and patching material to be used with the anti-graffiti coating.
 - 4. Sealants, patching materials, and expansion joints shall have been installed and approved.

3.05 GRAFFITI-RESISTANT COATING APPLICATION

- A. Apply graffiti-resistant coating full height of surfaces indicated to receive water repellents.
- B. Apply product in accordance with manufacturer's application instructions and recommendations for this specific project. Provide written copy of manufacturer's recommendations.
- C. Apply at temperature and weather conditions recommended by the manufacturer.
- D. Brush out surface residue thoroughly until they completely penetrate into the surface.
- E. Protect treated areas from rain and other surface water for a period of not less than four hours after application.

3.06 CLEANING

- A. As work progresses, clean spillage from adjacent surfaces using materials and methods recommended by manufacturer.
 - 1. Remove protective coverings from adjacent surfaces when no longer needed.

3.07 FIELD QUALITY CONTROL

- A. Test Area: Before any water repellent application, perform the following field evaluation.
 - 1. Prepare a three foot by three foot area to be sprayed with the water repellent where directed by the Architect. Apply the water repellent at a rate of square foot per gallon as recommended by manufacturer to meet warranty requirements.

2. After allowing five days for the sample to cure, run a RILEM uptake test on the treated area. Place one tube on the masonry and one tube on a mortar joint. Contact Architect at least one week prior to the application of the water repellent and the test.
 3. Repeat the test area procedure prior to application of graffiti-resistant coating.
- B. Coverage Test: Conduct in the presence of Architect:
1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
 2. Run random RILEM tests on each elevation of structure. Also, conduct splash tests in areas between RILEM tests to verify that the substrate is uniformly protected.
 3. After surfaces have adequately dried, recoat surfaces that show water absorption.
- C. Manufacturer's Field Services: Furnish written certification that surface preparation method and final condition has manufacturer's approval and comply with warranty.
1. Test Area: Furnish results of test area absorption on each type of substrate. Test results shall determine application rate.
- D. Demonstration: Demonstrate to Owner's personnel correct procedures for removal of graffiti from building.

END OF SECTION 071900

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Extruded polystyrene foam-plastic board insulation
2. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.

1. Sign, date, and post the certification in a conspicuous location on Project site.

B. Product test reports.

C. Research reports.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded Polystyrene Board Insulation, Type X: ASTM C578, Type X, 15-psi (104-kPa) minimum compressive strength; unfaced.

1. Manufacturers:

- a. Owens Corning
- b. Johns Manville

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
 - 1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 - 3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

2.3 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
 - 1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 - 3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

2.4 ACCESSORIES

- A. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.
 - 2. See drawings for extent of below slab insulation.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For wood-framed construction, install blankets according to ASTM C1320
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 - 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.

3.4 PROTECTION

- A. Protect installed insulation from damage
- B. due to harmful weather exposures, physical abuse, and other causes.
- C. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072500 – WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.
4. Drainage material.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Paper: ASTM D226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
- B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D; except with water-resistance rating not less than 1 hour.
- C. Building Wrap: ASTM E1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
 1. Manufacturers
 - a. 3M
 - b. Tyvek
 - c. Vaproshield
 2. Water-Vapor Permeance: Not less than 20 perms (1150 ng/Pa x s x sq.mper ASTM E96/E96M, Desiccant Method (Procedure A).
 3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

- D. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

- A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm)
 - 1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Rubberized-Asphalt Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
 - 1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.3 DRAINAGE MATERIAL

- A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding masonry veneer.
 - 1. Manufacturer
 - a. MasonPro
 - 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

2.4 LIQUID APPLIED AIR AND WATER RESISTIVE BARRIER

- A. General: Dryvit Backstop NTX is available in Texture, and Smooth and is a flexible polymer based, noncementitious, protective coating used as an air/water-resistive barrier when applied over acceptable exterior substrates.
- B. Design Requirements
 - 1. Acceptable surfaces for Backstop NTX include: (Refer to DS 181 for more specific requirements)
 - a. Exterior grade gypsum sheathing meeting ASTM C 1396 (formerly C 79) requirements for water resistant core or Type X core at the time of application.
 - b. Exterior sheathing having a water-resistant core with fiberglass mat facers meeting ASTM C 1177.
 - c. Exterior fiber reinforced cement or calcium silicate boards.
 - d. APA Exterior or Exposure 1 Rated Plywood, Grade C-D or better, nominal 1/2 in (12.7 mm) minimum, installed with the C face out.
 - e. Unpainted, unsealed concrete and CMU.

2. Backstop NTX can be exposed to weather up to 180 days to provide sufficient time for installation of the cladding. Inspect the surface of the Backstop NTX for any damage, cracks, voids or other detrimental conditions and repair prior to installation of the cladding.
3. Backstop NTX is not intended to be used as waterproofing for exterior horizontal surfaces or below grade applications
4. Deflections of the substrate systems shall not exceed 1/240 times the span.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover sheathing with water-resistive barrier as follows:
 1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch (50-mm) overlap and a 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails.
- C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
 1. Seal seams, edges, fasteners, and penetrations with tape.
 2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 1. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
 2. Lap flashing over water-resistive barrier at bottom and sides of openings.
 3. Lap water-resistive barrier over flashing at heads of openings.

3.3 DRAINAGE MATERIAL INSTALLATION

- A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

3.4 LIQUID APPLIED AIR AND WATER RESISTIVE BARRIER

- A. Prior to application of Backstop NTX the contractor shall verify that the substrate:
 1. Is of a type listed in Section 1.04.B.1.

2. Is flat within 1/4 in (6.4 mm) in a 4 ft (1.2 m) radius
3. Gaps do not exceed 1/4 in (6.4 mm). Larger gaps shall be corrected by replacing sheathing material.
4. Is sound, dry, connections are tight; has no surface voids, projections, or other conditions that may interfere with the application of Backstop NTX.
5. Is otherwise in conformance with Dryvit's Backstop NTX Data Sheet, DS455, and Application Instructions, DS181
6. Ambient and surface temperatures are minimum 25 °F (-4 °C) to maximum 100 °F (38 °C).
7. The contractor shall notify the general contractor and/or architect and/or owner of all discrepancies. Work shall not proceed until discrepancies have been corrected.
8. All roof/wall intersections, decks, balconies and other attachments, as well as eaves, chimneys, mechanical equipment, signage etc. are properly flashed to divert water to the outside of the specified cladding.
9. All openings and penetrations are properly flashed and wrapped with the air/water-resistant barrier to prevent water intrusion damage.
10. The Backstop NTX materials shall be protected by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.
11. Protect adjoining work and property during application of Backstop NTX.
12. The substrate shall be prepared as to be free of foreign materials such as oil, efflorescence, dust, dirt, paint, wax, water repellents, moisture, frost and any other materials that inhibit adhesion.

B. Installation: Backstop NTX – Smooth (Roller Application)

1. General: Backstop NTX – Smooth is used in conjunction with Dryvit Backstop NTX – Texture joint treatment and shall be applied in accordance with current, published Dryvit Backstop NTX Application Instructions, DS181.
2. Backstop NTX – Smooth is ready to use after an initial spin-up using a "Twister" paddle or equivalent mixing blade, powered by a 1/2 in (12.7 mm) drill, at 450 – 500 rpm. Do not add cement or any other additive.
3. Prior to Backstop NTX – Smooth application, sheathing joints, including inside and outside corners, shall be treated with Backstop NTX – Texture and Dryvit Grid Tape. All fastener heads shall also be spotted with Backstop NTX – Texture. Refer to Backstop NTX Application Instructions, DS181, for complete details. Allow to dry a minimum of 2 hours or until dry to the touch. Cool humid conditions will require longer drying time.
4. Apply Backstop NTX Smooth over the entire wall surface, including previously treated fasteners and sheathing joints. Refer to the chart on the Backstop NTX Product Data Sheet, DS455, or Application Instructions, DS181, for proper tools and respective coverage.
5. Allow to dry a minimum of 4 hours prior to application of Dryvit AquaFlash and adhesively applied EPS insulation board or specified cladding. Cool damp weather will require longer drying times.
6. Install the specified Dryvit Exterior Insulation and Finish System or specified cladding per published installation instructions for the specific system or cladding being used.

END OF SECTION 072500

SECTION 072600 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyethylene vapor retarders.
2. Under-Slab Vapor Retarders

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D4397, 15-mil- thick sheet, with maximum permeance rating of 0.1 perm

2.2 UNDERSLAB VAPOR RETARDERS

A. Under-slab Vapor retarder shall have all of the following qualities:

1. Maintain permeance of less than 0.03 Perms [grains / (ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Other performance criteria:
 - a. Strength: ASTM E1745 Class A.
 - b. Thickness: 15 mils minimum
3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

- B. Vapor retarder products:
 - 1. Basis of Design: Stego Wrap Class A Vapor Retarder by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.
 - 2. Other Approved Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GCP Applied Technologies (formerly Grace Construction Products); www.gcp.com.
 - b. Raven Industries, Inc.; www.ravenefd.com.
 - c. W. R. Meadows; www.wrmeadows.com
- C. ACCESSORIES (Listed accessories comply with Stego system. If other manufacturer is used provide same manufacturers recommended accessories.)
 - A. Seams:
 - 1. Stego Tape
 - B. Sealing Penetrations of Vapor Retarder:
 - 1. Stego Mastic
 - 2. Stego Tape
 - C. Perimeter/edge seal:
 - 1. Stego Crete Claw
 - 2. Stego Term Bar
 - 3. StegoTack Tape (double-sided sealant tape)

PART 3 - EXECUTION

3.1 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- A. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.2 INSTALLATION OF BELOW-SLAB VAPOR RETARDERS

- A. PREPARATION
 - 1. Ensure that subsoil is approved by Architect or Geotechnical Engineer.

- a. Level and compact base material.
- B. INSTALLATION (Installation instruction listed per Stego System. If other manufacture is used install per that, manufacturers recommended installation instructions.)
- A. Install vapor retarder in accordance ASTM E1643.
 1. Unroll vapor retarder with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 2. Extend vapor retarder 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 retarder. At the point of termination, seal vapor retarder to the foundation wall, grade beam or slab itself.
 - a. Seal vapor retarder to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
 3. Overlap joints 6 inches and seal with manufacturer's seam tape.
 4. Apply seam tape/Crete Claw to a clean and dry vapor retarder.
 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use Beast Form Stake and Beast Foot as a vapor barrier-safe forming system. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier.
 7. If non-permanent stakes must be 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 retarder.
 9. Repair damaged areas with vapor retarder 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.
 - C. PROTECTION
 1. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 072600

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standing-seam metal roof panels.

B. References:

1. Alternates 012300

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

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

- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

- C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

- B. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind loads: As indicated on Drawings
 - 2. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.

- F. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Hail Resistance: MH.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
 - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.
- B. Vertical-Rib, Seamed-Joint , Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
 - 1. Manufacturers
 - a. Taylor Metal
 - b. AEP Span
 - c. Metal Sales
 - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: .0236 inches
 - b. Exterior Finish: Polyvinylidene Fluoride
 - c. Color: As selected by Architect from manufacturer's full range
 - 3. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

- a. Thickness: 0.032 inch (0.81 mm)
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Polyvinylidene Fluoride
 - d. Color: As selected by Architect from manufacturer's full range
4. Clips: One-piece fixed to accommodate thermal movement.
 5. Panel Coverage: 16 inches (406 mm)
 6. Panel Height: 1.5 inches (38 mm)

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D1970.

2.4 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

- A. Panels and Accessories:
 1. Polyvinylidene Fluoride, full 70 percent Kynar 500® consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
1. Apply over the entire roof surface.
 - a. Roof perimeter for a distance up from eaves of 24 inches (610 mm) beyond interior wall line.
 - b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (152 mm).
 - c. Rake edges for a distance of 18 inches (460 mm).
 - d. Hips and ridges for a distance on each side of 12 inches (305 mm)
 - e. Roof-to-wall intersections for a distance from wall of 18 inches (460 mm).
 - f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm).
- B. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
1. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water..
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 4. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

- c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed steep-slope roof sheet metal fabrications.
5. Formed wall sheet metal fabrications.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.

10. Include details of special conditions.
11. Include details of connections to adjoining work.

- C. Samples: For each exposed product and for each color and texture specified, 12 inches by actual width.
- D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Special warranty.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.6 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: **20** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: See Drawings for further information.
 - a. Wind Design Data
 - 1) Risk Category: III
 - 2) Basic Design Wind Speed: Vult = 145 mph
 - 3) Exposure Category: C ($\lambda = 1.29$)
 - 4) Internal Pressure Coefficient: (GCpi) = ± 0.18 (Enclosed)
 - 5) Topographic Factor: Kzt = 1.0
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces

2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
 - 2. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - a. Color: As selected by Architect from full range of industry colors and color densities.
 - b. Color Range: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
 - 3. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 - 4. Color: As selected by Architect from manufacturer's full range.

5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 316, dead soft, fully annealed; with smooth, flat surface.
 1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).
 - D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
 1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.
- C. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
 1. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.
- D. Self-Adhering Membrane (SAM) Products:
 1. Roller apply all SAM types.
 2. Use approved primer when adhering to concrete, exterior gypsum and wood.
 3. Confirm compatibility between SAM and other envelope products with manufacturer warranties.
 4. Basis-of-Design Products:

- a. Jiffy Seal BUTYL Ice & Water Guard HT by Protecto Wrap Company; www.protectowrap.com.
 - b. VaproTape, 3-inch wide by VaproShield; www.vaproshield.com. For waterproofing use with Wrapshield.
 - c. WrapShield SA, Self-adhered by VaproShield; www.vaproshield.com.
- E. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

- H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- I. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 1. Material: Aluminum, 0.024 inch thick or Galvanized steel, 0.022 inch thick.
 - a. Match adjacent material and finish
 - 2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 - 3. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
 - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
 - 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Seams:
 - 1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- G. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters:
 - 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
 - 2. Fabricate in minimum 96-inch- long sections.
 - 3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
 - 4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 5. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
 - 6. Gutters with Girth up to 15 Inches Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
 - 7. Gutter Color: by Architect from Manufacturers standard options
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 1. Hanger Style: Fig. 1-35A in accordance with SMACNA's "Architectural Sheet Metal Manual." See architectural details.
 - 2. Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
 - 3. Downspout Color: Match adjacent material color. Transition color as necessary.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch thick.
- B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight.
 1. Fabricate from the following materials:
 - a. Galvanized Steel: 0.040 inch thick.
- C. Base Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch thick.
- D. Counterflashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.
- E. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Galvanized Steel: 0.028 inch thick.
- F. Roof-Drain Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.0156 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
 1. Galvanized Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
 1. Install in shingle fashion to shed water.
 2. Lap joints not less than 2 inches
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
 1. Lap horizontal joints not less than 4 inches
 2. Lap end joints not less than 12 inches
- C. Self-Adhering, High-Temperature Sheet Underlayment:
 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.

2. Prime substrate if recommended by underlayment manufacturer.
 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
 5. Overlap side edges not less than 3-1/2 inches Roll laps and edges with roller.
 6. Roll laps and edges with roller.
 7. Cover underlayment within 14 days.
- D. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
1. Install in shingle fashion to shed water.
 2. Lapp joints not less than 4 inches

3.2 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
1. Install fasteners protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- D. Fasteners: Use fastener sizes that substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
 1. Pretin edges of sheets with solder to width of 1-1/2 inches however, reduce pretinning where pretinned surface would show in completed Work.
 2. Do not solder metallic-coated steel and aluminum sheet.
 3. Do not pretin zinc-tin alloy-coated copper.
 4. Do not use torches for soldering.
 5. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.
 6. Stainless Steel Soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid-flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints in zinc where necessary for strength.

3.3 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:

1. Join sections with riveted and soldered joints or joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.
7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable or hinged to swing open for cleaning gutters.

C. Downspouts:

1. Join sections with 1-1/2-inch telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches o.c.
4. Connect downspouts to underground drainage system.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered centers.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
 - a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
 - b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.8 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 077100 – ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof-edge specialties.
 - 2. Roof-edge drainage systems.
 - 3. Reglets and counterflashings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roof specialties.
 - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For tests performed by a qualified testing agency.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 074113.16 Standing Seam Metal Roof Panels.
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 1. Design Pressure: As indicated under “Structural Design Criteria”
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 ROOF-EDGE SPECIALTIES

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous metal receiver with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
 1. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel, nominal 0.028-inch (0.71-mm) thickness.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Three-coat fluoropolymer
 - c. Color As selected by Architect from manufacturer's full range
 2. Corners: Factory mitered and soldered or continuously welded
 3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 4. Receiver: Manufacturer's standard material and thickness.
 5. Fascia Accessories: Fascia extenders with continuous hold-down cleats.
 6. Corners: Factory mitered and soldered or continuously welded
 7. Accessories: Fascia extenders with continuous hold-down cleats

2.3 ROOF-EDGE DRAINAGE SYSTEMS

- A. Gutters: Manufactured in uniform section lengths not exceeding 12 feet (3.6 m) with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.

2. Gutter Profile: according to SMACNA's "Architectural Sheet Metal Manual."
 3. Corners: Factory mitered and soldered or continuously welded.
 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
- B. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
- C. Zinc-Coated Steel Finish: Three-coat fluoropolymer
1. Color: As selected by Architect from manufacturer's full range

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F (116 deg C).
 2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C).

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
- B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.6 FINISHES

- A. Coil-Coated Galvanized-Steel Sheet Finishes:
1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A755/A755M and coating and resin manufacturers' written instructions.
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
1. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

3.2 INSTALLATION, GENERAL

- A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 4. Torch cutting of roof specialties is not permitted.
 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of uncoated aluminum and stainless steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
 2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.3 INSTALLATION OF ROOF-EDGE SPECIALITIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.4 INSTALLATION OF ROOF-EDGE DRAINAGE-SYSTEM

- A. Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches (610 mm) apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.
 - 1. Connect downspouts to underground drainage system indicated.

3.5 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder and sealants.
- B. Remove temporary protective coverings and strippable films as roof specialties are installed.

END OF SECTION 077100

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Mildew-resistant joint sealants.
6. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product data.
- B. Samples: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-sealant schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Submittals:
 1. Field-Adhesion-Test Reports: For each sealant application tested.
- B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty Documentation:
 1. Manufacturers' special warranties.
 2. Installer's special warranties.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Authorized representative who is trained and approved by manufacturer.
2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Acrylic Latex Joint Sealants: ASTM C 834, Type O, Grade NF. Application: Perimeter joints between interior wall surfaces, frames of interior doors, windows, elevator entrances etc. Paintable.

1. BASF Building Systems; Sonoloc
2. Bostik Inc.; Chem-Calk 600
3. May National Assoc.; Bondaflex 600
4. Pecora Corp.; AC-20+
5. Schnee-Morehead, Inc.; SM8200
6. Tremco Inc.; Tremflex 834

- B. Acrylic Latex Sealants: ASTM C 834, Type O, Grade NF, non-staining, paintable. Application: Interior perimeter and concealed joints of acoustic partitions
1. Miracle SCS-100
 2. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 3. US Gypsum Co, SHEETROCK Acoustical Sealant.
- C. Urethane Joint Sealants: Type M, Grade NS, Class 25, Uses (exposure) T and NT, Uses (substrates) M, A, O Application: Exterior vertical and horizontal non traffic joints in CIP and precast concrete, exterior control and expansion joints, exterior perimeter joints at frames of doors, windows, and louvers, vertical joints on exposed surfaces of interior concrete, vertical control and expansion joints on exposed interior surfaces of exterior walls.
1. BASF Building Systems; Sonostic NP 2
 2. May National Assoc.; Bondaflex PUR 2 NS
 3. Pacific Polymers;Elasto-Thane 227 High Shore Type II
 4. Pecora Corp.; Dynatred
 5. Sika Corp.; Sikaflex - 2c NS or Sikaflex 2c EZ mix
 6. Tremco; Vulkem 240 FC or Vulkem 227
- D. Urethane Joint Sealants: Type S or M, Grade P, Class 50, Uses (exposure) T and NT, Uses (substrates) M, A, O (brick & ceramic tile) Application: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces, exterior horizontal nontraffic and traffic isolation and contraction joints in CIP concrete slabs.
1. Type M (multi-component)
 - a. Polymeric Systems, Inc.; PSI-270
 - b. Sonneborn, Division of ChemRex; SL 2
 - c. Tremco Inc.; Dymeric 240 FC
 - d. Pecora Corp.; Dynatrol II-G
 - e. Sika Corp.; Sikaflex - 2c SL
 2. Type S (single-component)
 - a. Polymeric Systems, Inc.; PSI-901
 - b. Pacific Polymers Int.; Elasto-Thane 230 LM Type II
- E. Silicone Joint Sealants: Type S, Grade NS, Class 50, Uses (exposure) NT, Uses (substrates) M, G, A, O (brick, galv. steel) Application: Exterior joints in stucco systems.
1. Neutral-Curing Silicone Sealant
 - a. Dow Corning Corp.; 790
 - b. GE Silicones; SillPruf LM SCS2700
 - c. Tremco Inc.; Spectrem 1 (basic)
 - d. Pecora Corp.; 890
 - e. Sonneborn Division of ChemRex; Omniseal
 2. Siyl-Terminated Polyether Sealant
 - a. Sonneborn Division of ChemRex; 150 VLM
- F. Silicone Joint Sealants: Type S, Grade NS, Class 50, Uses (exposure) NT, Uses (substrates) M, G, A, O (brick, galv. steel) Application: Exterior joints between aluminum-framed entrances and storefronts and curtain wall systems.
1. Dow Corning; 756 SMS
 2. GE Silicones; SilPruf NB SCS9000

- G. Silicone Joint Sealants: Type S, Grade NS, Class 25, Uses (exposure) NT, Uses (substrates) G, A, O (ceramic tile) Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. Mildew-Resistant Neutral-Curing Silicone Sealant
 - a. Pecora Corp.; 898
 - 2. Mildew-Resistant Acid-Curing Silicone Sealant
 - a. Dow Corning; 786 Mildew Resistant
 - b. GE Silicones; Sanitary SCS1700
 - c. Sonneborn, Division of ChemRex; OmniPlus
 - d. Tremco; Tremsil 200 White

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
 - 4. Provide flush joint profile in accordance with Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth in accordance with Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

- H. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - a. Extent of Testing: Test completed and cured sealant joints as follows:
 - 1) Perform 10 tests for the first 1000 ft. (300 m) of joint length for each kind of sealant and joint substrate.
 - 2) Perform one test for each 1000 ft. (300 m) of joint length thereafter or one test per each floor per elevation.
 - b. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - c. Inspect tested joints and report on the following:
 - 1) Whether sealants filled joint cavities and are free of voids.
 - 2) Whether sealant dimensions and configurations comply with specified requirements.
 - 3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 - d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 - e. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

2. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- B. Prepare test and inspection reports.

END OF SECTION 079200

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. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 09 Sections "Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 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.

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.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 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.

- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

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).

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, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
 - 1. Design: Flush panel.
 - 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".

- a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
 - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
 - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, 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. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
 3. Core Construction: Manufacturer's standard polyurethane. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 3.2 or better.
 4. Core Construction: Manufacturer's standard vertical steel-stiffener core. Minimum 22 gauge steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).
 5. 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.
 6. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 7. 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.
 8. 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.
 9. 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 - 777 Trio-E 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.
- C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Manufacturers Basis of Design:
 - a. Curries Company (CU) – M CM Series.
 - b. Curries Company (CU) – Thermal Break TQ Series.
- D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
 - 1. Blade Type: Vision proof inverted V or inverted Y.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 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.

2.8 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.

2.9 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.

2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 083613 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sectional-door assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
 - 2. For power-operated doors, include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For manufacturer's warranty and finish warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.
- B. Manufacturer's warranty.
- C. Finish warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Failure of components or operators before reaching required number of operation cycles.
 - c. Faulty operation of hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
 - e. Delamination of exterior or interior facing materials.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.
 - 1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide sectional doors that comply with performance requirements specified without failure from defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

- B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
 - 1. Design Wind Load: As indicated on Drawings
 - 2. Testing: In accordance with ASTM E330.
 - 3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
 - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of door width.
 - b. Deflection of horizontal track assembly shall not exceed 1/240 of door height.
 - 4. Operability under Wind Load: Design sectional doors to remain operable under design wind load, as indicated on drawings, acting inward and outward.
- C. Seismic Performance: Provide sectional doors that withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
 - 1. Component Importance Factor: 1.5

2.3 SECTIONAL-DOOR ASSEMBLY

- A. Steel Sectional Door: Provide sectional door formed with hinged sections and fabricated so that finished door assembly is rigid and aligned with tight hairline joints; free of warp, twist, and deformation; and complies with requirements in DASMA 102.
 - 1. Manufacturers:
 - a. Wayne-Dalton
 - b. Overhead Door Company
- B. Operation Cycles: Door components and operators capable of operating for not less than 25,000 operation cycles. One operation cycle is complete when door is opened from closed position to the open position and returned to closed position.
- C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. (2.03 L/s per sq. m) when tested in accordance with ASTM E283 or DASMA 105
- D. U-Value: 0.052 Btu/sq. ft. x h x deg F (0.295 W/sq. m x K).
- E. Steel Door Sections: ASTM A653/A653M, zinc-coated (galvanized), cold-rolled, commercial steel sheet with G60 (Z180) zinc coating.
 - 1. Door-Section Thickness: 1-3/4 inches
 - 2. Section Faces:
 - a. Exterior Face: Fabricated from single sheets, not more than 24 inches (610 mm) high; with horizontal meeting edges rolled to continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove, weather- and pinch-resistant seals and reinforcing flange return.
 - 1) Steel Sheet Thickness: 0.022-inch (0.56-mm) nominal coated thickness.

- F. Track: Manufacturer's standard, galvanized-steel, standard-lift system. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides.
1. Material: Galvanized steel, ASTM A653/A653M, minimum G60 (Z180) zinc coating.
 2. Size: As recommended in writing by manufacturer for door size, weight, track configuration and door clearances indicated on Drawings
 3. Track Reinforcement and Supports: Provide galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device.
 - a. Vertical Track: Incline vertical track to ensure weathertight closure at jambs. Provide continuous angle attached to track and wall.
 - b. Horizontal Track: Provide continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.
- G. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom top and jambs of door. Provide combination bottom weatherseal and sensor edge for bottom seal.
- H. Windows: Manufacturer's standard window units of shape and size and in locations indicated on Drawings. Set glazing in vinyl, rubber, or neoprene glazing channel. Provide removable stops of same material as door-section frames. Provide the following glazing:
1. Clear Float Glass: 3 mm thick and complying with ASTM C1036, Type I, Class 1, Quality-Q3.
 2. Clear Acrylic Plastic: 3 mm thick, transparent, smooth or polished, and formulated to be UV resistant.
- I. Hardware: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless steel, or other corrosion-resistant fasteners, to suit door type.
1. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch (2.01-mm) nominal coated thickness at each end stile and at each intermediate stile, in accordance with manufacturer's written recommendations for door size.
 - a. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible.
 - b. Provide double-end hinges where required for doors more than 16 ft. (4.88 m) wide unless otherwise recommended by door manufacturer in writing.
 2. Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races, mounted to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Match roller-tire diameter to track width.
 3. Push/Pull Handles: Equip each door with galvanized-steel lifting handles on each side of door, finished to match door.

J. Locking Device:

1. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.

K. Counterbalance Mechanism:

1. Torsion Spring: Adjustable-tension torsion springs complying with requirements of DASMA 102 for number of operation cycles indicated, mounted on torsion shaft.
2. Cable Drums and Shaft for Doors: Cast-aluminum cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised.
 - a. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.
 - b. Provide one additional midpoint bracket for shafts up to 16 ft. (4.88 m) long and two additional brackets at one-third points to support shafts more than 16 ft. (4.88 m) long unless closer spacing is recommended in writing by door manufacturer.
3. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.
4. Cable Safety Device: Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if lifting cable breaks.
5. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
6. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

L. Manual Door Operator:

1. Push-Up Operation: Lift handles and pull rope for raising and lowering doors located on inside and outside of bottom section; with counterbalance mechanism designed so that required lift or pull for door operation does not exceed 25 lbf (111 N).
2. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25 lbf (111 N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

M. Metal Finish: Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

1. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; in accordance with manufacturer's written instructions.
- B. Tracks:
 - 1. Fasten vertical track assembly to opening jambs and framing with fasteners spaced not more than 24 inches (610 mm) apart.
 - 2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install automatic garage doors openers in accordance with UL 325.

3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

- D. Touchup Painting Galvanized Material: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780/A780M.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes vinyl-framed windows.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. Window: **10** years from date of Substantial Completion.
 - b. Glazing Units: **10** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 1. Minimum Performance Class: R.
 2. Minimum Performance Grade: 15.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.45
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.33.
- E. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 2 for basic protection.
 1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.

2.2 VINYL WINDOWS

- A. Manufacturers: Subject to compliance with requirements.
 1. Anderson
 2. Milguard
 3. Ply Gem
- B. Operating Types: As indicated on Drawings.
- C. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Finish: Integral color, white.
 2. Gypsum Board Returns: Provide at interior face of frame.
- D. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.
 1. Kind: Fully tempered where indicated on Drawings.
- E. Insulating-Glass Units: ASTM E2190.
 1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Low-E
 - b. Kind: Fully tempered where indicated on Drawings.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating: Pyrolytic on second surface.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Provide manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: Match window.

H. Horizontal-Sliding Window Hardware:

1. Sill Cap/Track: Designed to comply with performance requirements indicated and to drain to the exterior.
2. Locks and Latches: Operated from the inside only.
3. Roller Assemblies: Low-friction design.

I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, outside for sliding sashes.

B. Aluminum Frames: Complying with SMA 1004 or SMA 1201.

1. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
2. Finish for Exterior Screens: Matching color and finish of cladding.

C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.

1. Mesh Color: Manufacturer's standard.

2.4 FABRICATION

A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze vinyl windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections.

Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.

- E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085313

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. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.

5. ANSI/UL 437- Key Locks.

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. 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.

D. 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.

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 Procedures.

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. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. 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.

D. 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.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.

4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door 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. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

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 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: With the exception of electric through wire hinges, 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) - BB Series, 5 knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5 knuckle.

2.3 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. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

4. Tubular deadlocks and other auxiliary locks.
5. 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.
6. Keyway: Manufacturer's Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "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: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. 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.

2.4 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.
 - b. Sargent Manufacturing (SA) - 8200 Series.

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.7 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.
 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. 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 Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Sargent Manufacturing (SA) - 281 Series.

2.8 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 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. Ives (IV).
 - b. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed 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. Norton Rixson (RF).
 - b. Sargent Manufacturing (SA).

2.9 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 (PE).

2.10 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.

2.11 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 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 (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

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 and are based on Floor plan & Door schedule dated 05/03/2023. 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.
1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
1. MK - McKinney
 2. PE - Pemko
 3. RF - Rixson
 4. RO - Rockwood
 5. SA - SARGENT
 6. DO – Don-Jo Mfg.

Hardware Sets**Set: 1.0**Doors: [101](#)

Description: EXTERIOR HM - STORAGE

3 Hinge (heavy weight)	T4A3386 (NRP)	US32D	MK
1 Storeroom/Closet Lock	LC 8204 FEL	US26D	SA
1 Mortise Cylinder	as req'd - Match existing key system		
1 Surf Overhead Stop (hvy duty)	9-X36	630	RF
1 Surface Closer - Tri Pack	281 UO mounting as req'd	EN	SA
1 Threshold	271A or Per Sill Detail		PE
1 Smoke Gasketing	S88BL		PE
1 Sweep	315CN		PE
1 Latch Protector	320-RKW	US32D	RO

Set: 2.0Doors: [102](#)

Description: EXTERIOR HM - STORAGE

3 Hinge (heavy weight)	T4A3386 (NRP)	US32D	MK
1 Storeroom/Closet Lock	LC 8204 FEL	US26D	SA
1 Mortise Cylinder	as req'd - Match existing key system		
1 Surf Overhead Stop (hvy duty)	9-X36	630	RF
1 Surface Closer - Tri Pack	281 UO mounting as req'd	EN	SA
1 Threshold	271A or Per Sill Detail		PE
1 Smoke Gasketing	S88BL		PE
1 Rain Guard	346C (Omit @ overhang)		PE
1 Sweep	315CN		PE
1 Latch Protector	320-RKW	US32D	RO

Set: 3.0Doors: [103](#)

Description: EXTERIOR HM - SCORE KEEPING

3 Hinge (heavy weight)	T4A3386 (NRP)	US32D	MK
1 Classroom Security Intruder Lock	LC 8238 FEL	US26D	SA
2 Mortise Cylinder	as req'd - Match existing key system		
1 Surface Closer - Tri Pack	281 UO mounting as req'd	EN	SA
1 Threshold	271A or Per Sill Detail		PE
1 Smoke Gasketing	S88BL		PE
1 Sweep	315CN		PE

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing tapes.
6. Miscellaneous glazing materials.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Product test reports.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample warranties.

1.5 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
 3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

- C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.5 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.
- B. Neutral-Curing Silicone Glazing Sealant, Class 25: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks:
 1. Elastomeric material with Shore A durometer hardness of 85, plus or minus 5.
 2. Type recommended in writing by sealant or glass manufacturer.
- C. Spacers:
 1. Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 2. Type recommended in writing by sealant or glass manufacturer.
- D. Edge Blocks:
 1. Elastomeric with Shore A durometer hardness per manufacturer's written instructions.
 2. Type recommended in writing by sealant or glass manufacturer.
- E. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. 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, as determined by preconstruction testing.
- 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).
- 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 in accordance with requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- F. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.6 INSULATING GLASS SCHEDULE

- A. Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Locations indicated on building elevation drawings.
 - 2. Space between lites filled with minimum 90 percent argon.
 - 3. Low E Coating: Basis-of-design is Guardian SunGuard SN 68.
 - a. Acceptable alternates: Vitro Solarban 60 and Viracon VE-2M.
 - 4. Outboard Lite: Heat-strengthened clear float glass, fully tempered where required by Code, ¼” thick, minimum. Low-E coating on No. 2 surface.
 - 5. Inboard Lite: Heat-strengthened clear float glass, fully tempered where required by Code, ¼” thick, minimum.
 - 6. Total Thickness: 1”.
 - 7. Thermal Transmittance (U-Value), Winter – Center of Glass: 0.29, maximum.
 - 8. Visible Light Transmittance (VLT): 68 percent, nominal.
 - 9. Solar Heat Gain Coefficient (SHGC): 0.38, maximum.
 - 10. Visible Light Reflectance, Outside: 11 percent, nominal.
- B. Single-thickness, clear float glass, fully tempered.
 - 1. Applications: Interior.

2. Thickness: Minimum $\frac{1}{4}$ " (6-mm).

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Texture finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board: ASTM C1396/C1396M.
 - 1. Thickness: See drawings for thickness.
 - 2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc
 - 2. Shapes:
 - a. Cornerbead.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound

2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 INSTALLATION AND FINISHING OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- H. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- I. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- J. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation, paint materials, and application of paint systems on new substrates and existing substrates disturbed by seismic upgrade work, including but not necessarily limited to:
 - 1. Exterior fiber cement siding and wood trim.
 - 2. Interior gypsum board.
- B. Provide labor, materials, tools and other equipment, services and supervision required to complete interior painting and decorating work as indicated on Finish Schedules and Drawings and Specifications.
- C. Related Requirements:
 - 1. Section 072600 "Vapor Retarders."
 - 2. Section 081113 "Hollow Metal Doors and Frames".
 - 3. Section 087100 "Door Hardware" for preparation prior to finishing of existing doors and frames to remain.
 - 4. Section 092900 "Gypsum Board" for preparation prior to painting of gypsum board surfaces.
 - 5. Materials Finish Legend on Drawings for Paint schedule.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Matte or Flat Finish: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 3: Eggshell Finish: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 4: Satin Finish: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 5: Semi-Gloss Finish: 35 to 70 units at 60 degrees, according to ASTM D523.
- E. MPI Gloss Level 6: Gloss Finish: 70 to 85 units at 60 degrees, according to ASTM D523.

- F. MPI Gloss Level 7: High Gloss Finish: More than 85 units at 60 degrees, according to ASTM D523.

1.3 REFERENCES

A. ASTM International:

1. ASTM C834, Standard Specification for Latex Sealants.
2. ASTM D16, Standard Terminology for Paint, Related Coatings, Materials, and Applications.
3. ASTM D4442, Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

B. Architectural Painting Specification Manual by the Master Painters Institute (MPI), including Evaluation, Systems, Preparation and Approved Product List (MPI Manual).

C. Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

1.4 SYSTEM DESCRIPTION

A. Painting and finishing shall include all coating systems materials, including primers, emulsions (except asphalt based), enamels, stains, sealers and fillers and other applied materials, whether used as prime, intermediate or finish coats.

1. Materials to Paint:

- a. Unless otherwise indicated in documents, Work receives painting and finishing. Consult Drawings, Schedules, and other specification Sections for complete requirements. Where materials required to be finished are not indicated in the Finish Schedule or Drawings, refer to the MPI Manual for the appropriate finish; provide premium grade finish.

2. Materials Not to Paint:

- a. Finished metal surfaces of anodized aluminum, polyvinylidene fluoride (PVDF), stainless steel, chromium plate, copper, bronze, and similar finished metals will not require finish painting, except as indicated otherwise.
- b. Glass and plastic, except as noted otherwise.
- c. Materials having complete factory finish or that require installer finishing, except as indicated otherwise. Shop priming of ferrous metal items and shop-fabricated components is included under various Sections.
- d. Walls and ceilings in concealed and generally inaccessible areas, above suspended ceilings, furred areas, pipe spaces, duct shafts, and the like.
- e. Concrete floors, except as indicated to be painted.

- f. Moving parts of operating units, moving parts of mechanical and electrical units, linkages, sensing devices, motor and fan shafts, and the like.
- g. Code-required labels such as Underwriter's Laboratories, Factory Mutual, and Warnock-Hershey or any equipment identification, performance rating, name or nomenclature plates, and the like.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. VOC content.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE

- A. Quality Standard:
 - 1. Work of this Section shall conform to not less than the minimum standards for material and Work including inspection and warranty requirements set forth in the MPI Manual.
 - 2. Work of this Section shall be of the grade and finish system in accordance with the MPI as indicated in Painting and Finishing Schedule in Part 3 of this Section.
- B. Qualifications:
 - 1. Product Manufacturers: As listed in MPI and Color and Material Schedule in Drawings.
 - 2. Applicator: Company specializing in and regularly engaged in performing Work of this Section with not less than three (3) years' experience. Maintain regular work force of qualified journey-level personnel, trained, skilled, and experienced in performing required

Work and constant competent supervision. Apprentices may be employed working under qualified journeymen's directions in accordance with trade regulations.

C. Regulatory Requirements:

1. Comply with applicable federal, state, and local requirements and publications pertaining to environmental protection and the protection of the health and safety of workers, visitors to the site, and persons occupying the Project Site.
2. Where conflict among requirements or with this specification exists, the most stringent shall govern.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Perform no interior painting or decorating work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and after paint application. Provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- C. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- D. Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- E. Perform no painting or decorating work unless a minimum lighting level of 323 Lux (30-foot candles) is provided on surfaces to be painted or decorated.
- F. Perform no painting or decorating work when the maximum moisture content of the substrate exceeds:
1. 15 percent for wood.
 2. 12 percent for plaster and gypsum board.
- G. Conduct moisture tests using a properly calibrated electronic moisture meter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. As listed in the Interior Painting Schedule.

1. Basis-of-Design Manufacturer: Sherwin-Williams Co.; www.sherwin-williams.com.
2. Other Approved Manufacturers:
 - a. Benjamin Moore and Co.; www.benjaminmoore.com.
 - b. Miller Paint; www.millerpaint.com.
 - c. PPG Industries, Inc.; www.ppgpaints.com.
 - d. Rodda Paint Co.; www.rodmapaint.com.

2.2 PAINT, GENERAL

A. Materials:

1. Only materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, etc) listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project. Paint materials shall be from a single source manufacturer for each system used.
2. Other materials such as linseed oil, shellac, thinners, solvents, etc shall be the highest quality product of an MPI listed manufacturer and shall be compatible with paint materials being used as required.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

2.3 EQUIPMENT

A. Painting and Decorating Equipment: To best trade standards for type of product and application.

2.4 MIXING AND TINTING

- A. Unless otherwise specified herein or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.
- B. Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- C. Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- D. If required, thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

2.5 FINISH AND COLORS

- A. Unless otherwise specified herein, all painting work shall be in accordance with MPI Premium Grade finish requirements.
- B. Refer to Finish Schedule and Drawings for identification and location of colors.
- C. Except as noted herein or indicated in the Finish Schedule, interior walls and ceiling surfaces shall be painted in accordance with the following criteria over appropriate prime / sealer coat:
 - 1. All areas (except as noted): washable latex with GL3 (eggshell) finish.
 - 2. Bathrooms: washable latex with G5 (semi-gloss) finish.
- D. Access doors, prime coated butts, and other prime coated hardware, registers, radiators and covers, exposed piping and electrical panels shall be painted to match adjacent surfaces (i.e. same color, texture and sheen), unless otherwise noted or where pre-finished.
- E. Plywood service panels (e.g. electrical, telephone, and cable vision panels) including edges shall be back-primed and painted to match painted wall mounted on.
- F. The inside of duct work behind louvers, grills and diffusers for a minimum of 18 inches (460 mm) or beyond sight-line, whichever is greater, shall be painted using flat black (non-reflecting) paint.

2.6 GLOSS AND SHEEN RATINGS

- A. As indicated in Part 3 of these Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. Carefully clean and replace all such items upon completion of painting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes).
 - 2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

- D. Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from painting operations and damage with drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.
- E. Substrate defects shall be made good and sanded by others ready for painting particularly after the first coat of paint. Start of finish painting of defective surfaces (e.g. gypsum board) shall indicate acceptance of substrate and any costs of making good defects shall be borne by the painter including re-painting of entire defective surface (no touch-up painting).
- F. Wood Substrates:
 - 1. Scrape and clean knots and, apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but, provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Tolerances: Final application shall match color and texture of approved samples and shall be smooth, uniform in appearance, color, texture, sheen, and shall be free of runs, sags, holidays, lap marks, air bubbles, pin holes, and other detrimental effects in accordance with requirements of the MPI and this Specification.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Fiber-Cement Soffit and Trim, Opaque Finish:
 - 1. Acrylic System:
 - a. Prime Coat: Primer, S-W Exterior Oil-Based Wood Primer for exterior wood.
 - b. Intermediate Coat: S-W Duration Exterior Acrylic Latex, Satin Sheen.
 - c. Topcoat: S-W Duration Exterior Acrylic Latex, Satin Sheen.
- B. Galvanized Metal: (doors, frames, misc. steel)
 - 1. Two water-based light industrial Coats (over alkyd primer).
 - 2. Finish Sheen: Gloss Level 5.
 - a. Primer: S-W Kem Kromik Universal Metal Primer.
 - b. Finish: S-W Pro Industrial Acrylic Semi-Gloss, B66 Series, (less than 50 g/L VOC).

3.7 INTERIOR PAINTING SCHEDULE

- A. Structural Steel and Metal Fabrications: (columns, beams, joists, etc.)
 - 1. Two water-based light industrial Coats (over alkyd primer).
 - 2. Finish Sheen: Gloss Level 5.
 - a. Primer: S-W Kem Kromik Universal Metal Primer.
 - b. Finish: S-W Pro Industrial Acrylic Semi-Gloss, B66 Series, (less than 50 g/L VOC).
- B. Galvanized Metal: (doors, frames, misc. steel, pipes, ducts, etc.)
 - 1. Two water-based light industrial Coats (over alkyd primer).
 - 2. Finish Sheen: Gloss Level 5.
 - a. Primer: S-W Kem Kromik Universal Metal Primer.

- b. Finish: S-W Pro Industrial Acrylic Semi-Gloss, B66 Series, (less than 50 g/L VOC).
- C. Galvanized Metal: (hand railings, guard rails)
 - 1. Two water-based urethane coats (over alkyd primer).
 - 2. Finish Sheen: Gloss Level 5.
 - a. Primer: S-W Kem Kromik Universal Metal Primer.
 - b. Finish: S-W Hydro Gloss Single Component W/B Urethane B65W181 Series, (less than 250 g/L VOC).
- D. Finish Carpentry and Opaque Finish:
 - 1. Water-based acrylic-alkyd (over alkyd primer).
 - 2. Finish Sheen: Gloss Level 5.
 - a. Primer: S-W, Premium Wall & Wood Primer, one coat.
 - b. Finish: S-W, ProMar 200 Waterbased Acrylic-Alkyd (less than 50 g/L VOC), two coats.
- E. Gypsum Board: (Class Rooms, Offices, Hallways, Utility Rooms, etc.)
 - 1. Two acrylic coats (over vinyl acrylic primer).
 - a. Use PVA primer as vapor retarder as specified in Section 072600 "Vapor Retarders."
 - 2. Finish Sheen: Gloss Level 3.
 - a. Primer: S-W ProMar 200 Zero VOC Interior Latex Primer B28W02600 (Volume Solids: 26 percent plus or minus 2 percent)
 - b. Finish: S-W ProMar 200 Zero VOC Int Latex Egg Shell, B20-2600 Series (Volume Solids: 42 percent plus or minus 2 percent)
- F. Gypsum Board: (Damp areas with higher maintenance requirements including Toilets, and Maintenance Spaces)
 - 1. Two water-based high-performance acrylic coats (over vinyl acrylic primer).
 - 2. Finish Sheen: Gloss Level 5.
 - a. Primer: S-W ProMar 200 Zero VOC Interior Latex Primer B28W02600 (Volume Solids: 26 percent plus or minus 2 percent).
 - b. Finish: S-W Pro Industrial Acrylic Semi-Gloss, B66 Series, (less than 50 g/L VOC), Volume Solids: 35 percent plus or minus 2 percent.

3.8 COLOR SCHEDULE

- A. See Drawings for "Finish Schedule" for PT#.
- B. Coordinate finish colors with systems indicated in other Sections and in the Color and Materials Schedule.

- C. Basis-of-Design Manufacturer is for color only. Provide color match where different paint manufacturer is used.
- D. Where surfaces are scheduled for primer only, provide primer indicated for substrate in systems listed above.

END OF SECTION 099100

SECTION 099600 – HIGH-PERFORMANCE COATINGS**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. High performance coatings (HPC) for the following conditions:
 - 1. Exterior Substrates:
 - a. Galvanized steel.
- B. Surface preparation.

1.02 RELATED REQUIREMENTS

- A. Section 13 34 19 – “Metal Building Systems”

1.03 REFERENCE STANDARDS

- A. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test.
- B. ASTM D6386 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- D. SCAQMD 1113 - Architectural Coatings.
- E. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements.
- F. SSPC-SP 3 - Power Tool Cleaning.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Include printed statement of VOC content and chemical components for interior coatings.
- C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
 - 1. Submit Samples on shop primed and galvanized steel, 8 inches square.

- D. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Data: Include cleaning procedures and repair and patching techniques.
 - 1. At project completion, provide an itemized list complete with manufacturer, coating type and color coding for all colors used for Owner's later use in maintenance.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Coating Materials: 1 gallon of each type and color.
 - 3. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
 - 1. Preparation and Workmanship: Comply with requirements in MPI (APSM) - "Master Painters Institute Architectural Painting Specification Manual" for products and coating systems indicated.
- B. Surface Preparation: Obtain written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator(s) to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.
- C. Comply with requirements of SSPC-PA 2 for measurement of coating thickness.

1.06 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers. Agenda items will include field conditions, substrate conditions, coordination of shop applied primers with finish coatings, application methods, and field quality control testing and inspection.
 - 1. Bring copies of reviewed color draw-downs for all required colors.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.
- C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
- F. Restrict traffic from area where coating is being applied or is curing.
- G. Lead Paint: Lead paint is present in buildings and structures to be painted. A report on the presence of lead paint is included in Document 00 31 00 - Available Project Information. Examine report to become aware of locations where lead paint is present.
 - 1. Do not disturb lead paint or items suspected of containing hazardous materials except under procedures specified.
 - 2. Perform preparation for painting of substrates known to include lead paint in accordance with Section 02 83 13 - Lead Handling Procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products: Provide one of the products listed in Part 2.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in Part 2:
 - 1. Carboline Company (Carboline)
 - 2. Miller Paint Co. (Miller).
 - 3. Tnemec Company, Inc. (Tnemec).
 - 4. Substitutions: Not permitted.

2.02 MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated.
 - 1. For shop primed items, omit specified primer if shop primer is compatible with finish coats and in good condition as determined by finish coating manufacturer.

- B. Material Compatibility: Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- C. Volatile Organic Compound (VOC) Content:
 - 1. All paints and coatings wet applied on site must meet the applicable limits of SCAQMD 1113. VOC shall not exceed the limits indicated below:
 - a. Rust Preventative Coatings/Industrial Maintenance Coatings: 100 g/L.
- D. Colors: As indicated on drawings.

2.03 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

2.04 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
 - 1. Semi-Gloss, Two-Component, Pigmented Aliphatic Acrylic Polyurethane: One finish coat, over intermediate coat and metal primer with total dry film thickness not less than 6.5 mils, unless noted otherwise.
 - a. Prime: Manufacturer's recommended metal primer.
 - 1) Carboline: Galoseal WB at 0.5 to 1.0 mils DFT.
 - 2) Miller: PPG 97-145 Series Pitt-Guard D-T-R Polyamide Epoxy
 - 3) Tnemec: Series 27 Typoxy WB at 3 to 5 mils DFT.
 - b. Intermediate Coat:
 - 1) Carboline: None required.
 - 2) Miller: PPG 95-8800 Series Pitthane High Build Semi-Gloss Urethane.
 - 3) Tnemec: None required.
 - c. Finish Coat:
 - 1) Carboline: Carbothane 133 MC at 3 to 5 mils.
 - 2) Miller: PPG 95-8800 Series Pitthane High Build Semi-Gloss Urethane.
 - 3) Tnemec: Series 1095 Endura-Shield Semi-Gloss at 2 to 3 mils DFT.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.

- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Proceed with coating application only after unacceptable conditions have been corrected.
 - 1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in MPI (APSM) applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
 - 2. At interior steel abrade the top layer of primer, unless otherwise required by coating manufacturer.
- D. Steel Substrates: Remove rust and loose mill scale.
 - 1. Prepare interior surfaces as recommended by coating system manufacturer and according to SSPC-SP 3 "Power Tool Cleaning."
 - 2. Level of surface preparation specified is a minimum. If the coating manufacturer requires a higher degree of preparation, comply with the coating manufacturer's recommendations.
- E. Galvanized-Metal Substrates: Prepare galvanized surfaces to receive high-performance coatings in accordance with ASTM D6386.
- F. Remove finish hardware, fixture covers, and accessories and store.
- G. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual". Use applicators and techniques suited to coating and substrate indicated.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color and appearance.
- D. When the color of a door frame changes from side to side, the change shall be made at the edge of the stop, where the transition is not visible when the door is in a closed position.

3.05 FIELD QUALITY CONTROL

- A. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to Architect.
 - 1. Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, or foreign materials in paint coatings.
 - 2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners, reentrant angles or similar conditions.
 - 3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - 4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - 5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- B. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces:
 - 1. Visible defects are evident on vertical or horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
 - 2. Visible defects are evident on ceilings, soffits and other overhead surfaces when viewed at normal viewing angles.
 - 3. When the final coat on any surface exhibits a lack of uniformity of color, sheen texture and hiding across full surface area.
 - 4. Dry mil thicknesses do not meet manufacturer's recommended thickness or specified thickness.
 - 5. Lack of adhesion. Test surfaces indicating lack of adhesion in accordance with ASTM D3359 or as recommended by coating manufacturer.

- C. Owner may provide field inspection and testing.
 - 1. Painted surfaces will be tested for dry mil thickness for each coat.
 - 2. Shop primers and painted surfaces will be tested for adhesion.
 - 3. Surfaces will be tested at frequency discussed in the preinstallation conference and as deemed appropriate by Owner.
- D. Touch-up and restore painted surfaces damaged by testing.
 - 1. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.06 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.07 PROTECTION

- A. Protect finished work from damage.

3.08 EXTERIOR SCHEDULE

- A. Steel: Semigloss, Two-Component, Pigmented Aliphatic Acrylic Polyurethane: Surfaces to be painted include, but are not limited to, the following:
 - 1. Steel bollards.
 - 2. Hollow metal doors and frames.

END OF SECTION

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.
 - 1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type: Industrial grade external cartridge operated multipurpose A-B-C portable dry chemical fire extinguishers in 10 lb. (4.54 kg) size. The extinguishers shall meet or exceed the U.L. ratings.
 - 1. Extinguishing Agent: Designed for and rated for use with A-B-C rated multipurpose dry chemical powder; 4A:80B:C rating.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers in fire extinguishers cabinet locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

SECTION 114800 - ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes dugout equipment as follows:

1. Fixed bench.
2. Helmet rack.
3. Bat rack.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers Product Data.

1. Provide manufacturer's product literature, technical specifications and other data prior to actual field installation work for Architect's review.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers:

1. AALCO Athletic Equipment
2. Baseballracks
3. On Deck Sports

B. Substitutions: As approved per architect prior to bid date.

C. Requests for substitutions will be considered in accordance with provisions of Section 016000 - Product Requirements.

2.2 COMPONENTS

A. Bench

1. Two tiered bench with upper and lower level seating.
2. 15'-0" linear feet.

- B. Helmet Rack
 - 1. Accommodate (14) cubbies
 - 2. Hook strip
- C. Bat Rack
 - 1. Accommodate (21) bats

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify field conditions are acceptable and are ready to receive work.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPERATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Conceal bolts and screws whenever possible.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 114800

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ball valves.
- B. Check valves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 08 3100 - Access Doors and Panels.
- C. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- D. Section 22 0719 - Plumbing Piping Insulation.
- E. Section 22 1005 - Plumbing Piping.

1.03 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: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch 2013 (Reaffirmed 2018).
- B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2017.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.

- E. ASME B31.9 - Building Services Piping 2020.
- F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.
- G. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings 2015 (Reapproved 2021).
- H. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- I. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.
- J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
- K. NSF 61 - Drinking Water System Components - Health Effects 2020.
- L. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.05 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.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.
- E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.

1.06 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: Comply with ASME BPVC-IX.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

- C. Provide the following valves for the applications if not indicated on drawings:
 - 1. Shutoff: Ball, butterfly, gate or plug.
 - 2. Swing Check (Pump Outlet):
 - a. 2 inch (50 mm, DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
- D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- E. Domestic, Hot and Cold Water Valves:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint ends.
 - b. Ball: One piece, full port, brass with brass trim.
 - c. Bronze Swing Check: Class 125, bronze disc.
- F. Sanitary Waste Water Valves:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze Swing Check: Class 125, bronze disc.

2.02 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. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.
- D. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Solder Joint Connections: ASME B16.18.
- E. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.
 - 3. Building Services Piping Valves: ASME B31.9.
- F. Potable Water Use:
 - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- G. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRASS, BALL VALVES

- A. One Piece, Full Port with Brass Trim and Push-to-fit or Threaded Connections:
 - 1. Comply with MSS SP-110.
 - 2. CWP Rating: 200 psi (1,379 kPa).
 - 3. Body: Forged brass.
 - 4. Seats: PTFE.

5. Stem: Brass.
 6. Ball: Chrome-plated brass.
 7. Operator: Handle.
 8. Manufacturers:
 - a. Substitutions: See Section 01 6000 - Product Requirements.
- B. Two Piece, Full Port with Brass Trim and Female Thread, Male thread, or Solder Connections:
1. Comply with MSS SP-110.
 2. WSP Rating: 150 psi (1,035 kPa).
 3. WOG Rating: 600 psi (4,140 kPa).
 4. Body: Forged brass.
 5. Seats: PTFE.
 6. Ball: Chrome-plated brass.
 7. Operator: Lockable handle and memory stop.
 8. Manufacturers:
 - a. Apollo Valves; _____: www.apollovalves.com/#sle.
 - b. FNW; 410A: www.fnw.com/#sle.
 - c. Jomar Valves, a division of Jomar Group; _____: www.jomarvalve.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Two Piece, Full Port with Press Connections:
1. WOG Rating: 250 psi (1,724 kPa).
 2. Body: Forged brass.
 3. Seats: EPDM.
 4. Ball: Chrome-plated brass.
 5. Blow-out Proof Stem: Forged brass.
 6. Operator: Provide lockable handle.
 7. Maximum Service Temperature: 250 degrees F (121.1 degrees C).
 8. Manufacturers:
 - a. FNW; 430: www.fnw.com/#sle.
 - b. Jomar Valves, a division of Jomar Group; _____: www.jomarvalve.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 BRONZE, LIFT CHECK VALVES

- A. General:
1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
 2. CWP Rating: 200 psi (1,380 kPa).
 3. Design: Vertical flow.
 4. Body: Comply with ASTM B61 or ASTM B62, bronze.
 5. End Connections: Threaded.
 6. Disc (Type 2): NBR.
 7. Manufacturers:
 - a. Substitutions: See Section 01 6000 - Product Requirements.

2.05 BRASS, HORIZONTAL SWING CHECK VALVES

- A. Class 125, Threaded End Connections:
1. WOG Rating: 200 psi (1,380 kPa).
 2. Body: Forged brass.
 3. Disc: Forged brass.
 4. Hinge-Pin, Screw, and Cap: Forged brass.
 5. Manufacturers:
 - a. Jomar Valves, a division of Jomar Group; _____: www.jomarvalve.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Class 125, Press End Connections:
1. WOG Rating: 200 psi (1,380 kPa).
 2. Body: Forged brass.
 3. Disc: Forged brass.
 4. Hinge-Pin, Screw, and Cap: Forged brass.
 5. Manufacturers:
 - a. Jomar Valves, a division of Jomar Group; _____: www.jomarvalve.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 BRONZE, SWING CHECK VALVES

- A. General:
1. Fabricate from dezincification resistant material.
 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 2. Design: Y-pattern, horizontal or vertical flow.
 3. WOG Rating: 200 psi (1,380 kPa).
 4. Body: Bronze, ASTM B62.
 5. End Connections: Threaded.
 6. Disc: Bronze.
 7. Manufacturers:
 - a. Apollo Valves; _____: www.apollovalves.com/#sle.
 - b. Jomar Valves, a division of Jomar Group; _____: www.jomarvalve.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- C. Class 150:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 2. Design: Y-pattern, horizontal or vertical flow.
 3. WSP Rating: 150 psi (1,034 kPa).
 4. WOG Rating: 300 psi (2,068 kPa).
 5. Body: Bronze, ASTM B62.
 6. End Connections: Threaded or soldered.
 7. Disc: Bronze.
 8. Manufacturers:
 - a. FNW; 1241, Federal: www.fnw.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 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.

3.02 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

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Strut systems for pipe or equipment support.
- B. Pipe hangers.
- C. Pipe supports, guides, shields, and saddles.
- D. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping 2022.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures 1999 (Reapproved 2018).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- N. UL (DIR) - Online Certifications Directory Current Edition.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 05 5000.
 - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
 - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
 - 1. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - 2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

- A. Strut Channels:
 - 1. Manufacturers:
 - a. Unistrut, a brand of Atkore International Inc; _____: www.unistrut.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 - 2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
 - 3. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
 - 1. Threaded zinc-plated steel unless otherwise indicated.
 - 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
 - b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.
 - c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.
- C. Channel Nuts:
 - 1. Manufacturers:
 - a. Unistrut, a brand of Atkore International, Inc; _____: www.unistrut.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.03 PIPE HANGERS

- A. Band Hangers, Adjustable:
 - 1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.
 - b. Gripple, Inc; Universal Clamp (Threaded): www.griipple.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - d. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 - 2. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2.04 PIPE CLAMPS

- A. Riser Clamps:
 - 1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.
 - b. FNW; 7020: www.fnw.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - d. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
 - 2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

3. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).

B. Strut Clamps:

1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.
 - b. FNW; 7815: www.fnw.com/#sle.
 - c. Unistrut, a brand of Atkore International, Inc; _____: www.unistrut.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

2.05 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
 - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.

C. Pipe Supports, Thermal Insulated:

1. General 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. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
 - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
2. PVC Jacket:
 - a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
 - c. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

2.06 ANCHORS AND FASTENERS

A. Manufacturers - Mechanical Anchors:

1. FNW; 7502: www.fnw.com/#sle.
2. Hilti, Inc; _____: www.us.hilti.com/#sle.
3. Powers Fasteners, Inc; _____: www.powers.com/#sle.

4. Simpson Strong-Tie Company Inc; _____: www.strongtie.com/#sle.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- C. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- D. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- E. Hollow Masonry: Use toggle bolts.
- F. Hollow Stud Walls: Use toggle bolts.
- G. Sheet Metal: Use sheet metal screws.
- H. Wood: Use wood screws.
- I. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
1. Channel Material: Use galvanized steel.
 2. Manufacturer: Same as manufacturer of metal strut channel framing system.
- J. Concrete Inserts:
1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.
 - b. HoldRite, a brand of Reliance Worldwide Corporation; _____: www.holdrite.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 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

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tags.
- B. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.

2.02 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
 - 2. Brady Corporation: www.bradycorp.com/#sle.
 - 3. Brimar Industries, Inc: www.pipemarket.com/#sle.
 - 4. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 - 5. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 6. Seton Identification Products: www.seton.com/#sle.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.03 PIPE MARKERS

- A. Manufacturers:

1. Brady Corporation: www.bradycorp.com/#sle.
 2. Brimar Industries, Inc: www.pipemarker.com/#sle.
 3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
 4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 5. Seton Identification Products: www.seton.com/#sle.
 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. 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.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.
- F. Color code as follows:
1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
 2. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

- A. Install plastic pipe markers in accordance with manufacturer's instructions.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- C. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Manufactured sleeve-seal systems.
 - 6. Ball valves.
 - 7. Strainers.

1.02 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems 2015 (Reaffirmed 2020).
- B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250 2021.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
- E. ASME B31.1 - Power Piping 2022.
- F. ASME B31.9 - Building Services Piping 2020.
- G. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers 2023.
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.
- J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2023.
- L. ASTM B32 - Standard Specification for Solder Metal 2020.
- M. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- N. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.
- O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

- P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- S. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2021a.
- T. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings 2022.
- U. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter 2022.
- V. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2020.
- W. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- X. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe 2021.
- Y. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings 2021.
- Z. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- AA. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.
- BB. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems 2019a.
- CC. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- DD. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.
- EE. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80 2021.
- FF. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40 2017.
- GG. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80 2019.

- HH. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR) 2023.
 - II. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings 2022.
 - JJ. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing 2023.
 - KK. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing 2023a.
 - LL. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems 2018.
 - MM. AWWA C550 - Protective Interior Coatings for Valves and Hydrants 2017.
 - NN. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm) 2022.
 - OO. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2021.
 - PP. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2020.
 - QQ. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
 - RR. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
 - SS. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
 - TT. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
 - UU. NSF 61 - Drinking Water System Components - Health Effects 2020.
 - VV. NSF 372 - Drinking Water System Components - Lead Content 2020.
 - WW. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe 2021.
- 1.03 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements 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.
- 1.04 QUALITY ASSURANCE
- A. Perform work in accordance with applicable codes.

PART 2 PRODUCTS

2.01 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.

2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. ABS Pipe: ASTM D2661.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. ABS Pipe: ASTM F628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- D. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. ABS Pipe: ASTM F628.
 - 1. Fittings: ABS.
 - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2729.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 2. Joints: ASTM B32, alloy Sn95 solder.
- B. PE Pipe: ASTM D2239.
1. Fittings: ASTM D2609, PE.
 2. Joints: Mechanical with stainless steel clamp.
- C. PVC Pipe: AWWA C900.

2.06 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 2. Joints: ASTM B32, alloy Sn95 solder.
- B. PE Pipe: ASTM D2239.
1. Fittings: ASTM D2609, PE.
 2. Joints: Mechanical with stainless steel clamp.
- C. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
1. Manufacturers:
 - a. Uponor, Inc; _____: www.uponorengineering.com/#sle.
 - b. Viega LLC; PureFlow PEX with Corrugated Sleeve: www.viega.us/#sle.
 - c. _____.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. PPI TR-4 Pressure Design Basis:
 - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
 - b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
 - c. 80 psig (551 kPa) at maximum 200 degrees F (93 degrees C).
 3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
 4. Joints: ASTM F1960 cold-expansion fittings.

2.07 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 2. Joints: ASTM B32, alloy Sn95 solder.
 3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Apollo Valves; _____: www.apollovalves.com/#sle.
 - 2) Viega LLC; _____: www.viega.us/#sle.
- B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, using one of the following joint types:

1. Threaded Joints: ASME B16.4 cast iron fittings.
- C. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
 1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
- D. PVC Pipe: ASTM D1785 or ASTM D2241.
 1. Fittings: ASTM D2665, PVC.
 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
- E. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
 1. Manufacturers:
 - a. SharkBite, a brand of Reliance Worldwide Corporation; _____: www.sharkbite.com/#sle.
 - b. Uponor, Inc; _____: www.uponorengineering.com/#sle.
 - c. Viega LLC; _____: www.viega.us/#sle.
 - d. Zurn Industries, LLC; _____: www.zurn.com/#sle.
 2. PPI TR-4 Pressure Design Basis:
 - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
 - b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
 - c. 80 psig (551 kPa) at maximum 200 degrees F (93 degrees C).
 3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
 4. Joints: ASTM F1960 cold-expansion fittings.

2.08 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
 2. Joints: ASME B31.1, welded.

2.09 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 1. Fittings: ASTM A234/A234M, wrought steel welding type.
 2. Joints: ASME B31.1, welded.
 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.10 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) 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 Sizes Over 1 inch (25 mm, DN):
 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. No-Hub Couplings:
 1. Gasket Material: Neoprene complying with ASTM C564.

2. Band Material: Stainless steel.
3. Eyelet Material: Stainless steel.
4. Manufacturers:
 - a. MIFAB, Inc: www.mifab.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.11 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.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
 6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with 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; and as follows:
 - a. Bases: High-density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
 - e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.
 - f. Manufacturers:
 - 1) PHP Systems/Design: www.phpsd.com/#sle.
 - 2) Substitutions: See Section 01 6000 - Product Requirements.
- B. Plumbing Piping - Drain, Waste, and Vent:
 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
 4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.
5. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
6. Other Types: As required.
7. Manufacturers:
 - a. Powers Fasteners, Inc: www.powers.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.12 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Manufacturers:

1. The Metraflex Company; MetraSeal: www.metraflex.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Modular/Mechanical Seal:

1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

2.13 BALL VALVES

A. Manufacturers:

1. Apollo Valves: www.apollovalves.com/#sle.
2. Nibco, Inc: www.nibco.com/#sle.
3. Uponor, Inc: www.uponorengineering.com/#sle.
4. Viega LLC: www.viega.us/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

- B. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.14 RELIEF VALVES

A. Pressure Relief Valves:

1. Manufacturers:
 - a. Cla-Val Co: www.cla-val.com/#sle.
 - b. Flomatic Valves: www.flomatic.com/#sle.
 - c. Henry Technologies: www.henrytech.com/#sle.
 - d. Singer, a Mueller brand: www.singervalve.com/#sle.

- e. Watts Regulator Company: www.wattsregulator.com/#sle.
- f. Substitutions: See Section 01 6000 - Product Requirements.
- 2. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- 3. AWWA C550 compliant cast iron, bronze or brass body, elastomeric diaphragm, seat disc and epoxy coated both internally and externally.
 - a. Size: 1/2 to 40 inch (15 to 1,000 mm, DN), Class 150 flange ends.
 - b. Pressure Reducing Pilot-Operator Set
 - 1) Operating Range: 5 to 50 psi (0.35 to 35 Bar).
 - 2) Connected into brass, bronze, or stainless steel pilot piping and fittings.
 - 3) Precision fixed-flow restrictor, pressure gauges, and isolation valves.
 - 4) Include pilot-side strainer on valve sizes above 4 inch (100 mm, DN).
- B. Temperature and Pressure Relief Valves:
 - 1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

2.15 STRAINERS

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 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.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.

- H. Establish elevations of buried piping outside the building to ensure not less than 48 inches of cover.
- I. Provide support for utility meters in accordance with requirements of utility companies.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- K. Install water piping to ASME B31.9.
- L. 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.
- M. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- N. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 5. Provide copper plated hangers and supports for copper piping.
 - 6. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 7. Support cast iron drainage piping at every joint.
- O. Manufactured Sleeve-Seal Systems:
 - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 - 3. Locate piping in center of sleeve or penetration.
 - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 - 5. Tighten bolting for a watertight seal.
 - 6. Install in accordance with manufacturer's recommendations.

3.04 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

END OF SECTION

SECTION 23 8300
RADIANT HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electric radiant ceiling panel heaters.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. UL 2021 - Fixed and Location Dedicated Electric Room Heaters Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for ceiling panel heaters.
- C. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, installation instructions, maintenance and repair data, and parts listings.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 ELECTRIC RADIANT CEILING PANEL HEATERS

- A. Manufacturers:

1. INDEECO (Industrial Engineering and Equipment Company): www.indeeco.com/#sle.
 2. Marley Engineered Products: www.marleymep.com/#sle.
 3. Radiant Electric Heat, Inc: www.electricheat.com/#sle.
 4. Solid State Heating: www.sshcinc.com/#sle.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Provide products listed, classified, and labeled under UL 2021 as suitable for the purpose indicated.
- C. Suitable for surface mounting installation.
- D. Ceiling Panel Construction:
1. Galvanized, 22 gauge, 0.0299 inch (0.76 mm) minimum, sheet steel for the front panel.
 2. Exposed-Side Panel Finish: Factory prime coated for field painting.
- E. Heating Elements: Materials to consist of insulated resistive wires.
- F. Electrical Connections: Non-heating, high-temperature, insulated copper leads, factory connected to heating element.
- G. Electrical Characteristics:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Electric Radiant Ceiling Panel Heaters:
1. Examine areas to receive radiant heating units for compliance with requirements for installation tolerances and other conditions affecting performance.
 2. Ensure surfaces in contact with radiant heating panels are free of burrs and sharp protrusions.
 3. Ensure surfaces are level and plumb.
 4. Proceed with installation only after unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Clean all surfaces prior to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's recommendations.
- B. Electric Radiant Ceiling Panel Heaters:
1. Install level and plumb.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Electric Radiant Ceiling Panel Heaters:
1. Perform the following field tests and inspections and prepare test reports:

- a. Operate electric heating elements through each stage to verify proper operation and electrical connections.
- b. Test and adjust controls and safeties.
2. Remove and replace malfunctioning units and retest as specified above.

3.05 CLEANING

- A. Radiant Ceiling Panel Heaters: Remove paint splatters, other spots, dirt, and debris.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Demonstrate Operation of Controls for the following Equipment:
 1. Electric Radiant Ceiling Panel Heaters.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 26 0500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
1. Basic Requirements.
 2. Detailed Requirements.
 3. Demolition Requirements.
 4. Facilitation of New Services.
 5. Coordination.
 6. Quality Assurance.
 7. Codes, Ordinances, & Permits.
 8. Common requirements for electrical installation.
 9. Excavating & Backfilling.
 10. Painting.
 11. Cleaning & Rubbish

1.03 SUBMITTALS

- A. Shop Drawings:
1. Submit shop drawings, wiring diagrams, and descriptive literature on all equipment furnished in this contract. Contractor shall “approve” shop drawings as specified in Division 1 prior to submitting to Engineer for approval. Shop drawing submittals shall comply with Division 1 requirements.
 2. Make submittals as soon as practicable after the signing of the contract. Shipment shall not be released until drawings and literature have been finally approved.
 3. Shop drawings shall be checked by the Contractor for shape, dimensions, and details of attachment to the construction before submittal. Submitted shop drawings will be presumed to have been so checked by the Contractor.
 4. The literature shall be complete, giving materials, gauges, weights, finishes, etc., and in case of lighting fixtures, shall include ETL photometric curves.
 5. Wiring diagrams shall be furnished for all communication and control systems under this contract.
 6. In addition to the foregoing, the Contractor is to supply to the General Contractor, for delivery to the Owner, bound in a single set, a complete shop drawing portfolio of all equipment indicated under the specific specification section. Submit these near completion of the project arranged and indexed according to the CSI format.
- B. Test reports: Submit written installation test reports for review and approval immediately after testing has been satisfactorily completed.

- C. Acceptance certificates: Submit written manufacturer, testing agency and/or local Code authority acceptance certificates with project closeout documentation.
- D. Warranty: Submit a written warranty statement detailing all system and equipment warranties.
- E. Operation & Maintenance Instructions:
 - 1. Refer to Division 1 for submittal and training requirements.
 - 2. Furnish approved digital operation and maintenance instruction booklets covering each listed item of equipment installed under this contract. These booklets shall provide complete instructions on the proper operation, use and periodic maintenance, together with the source of replacement parts and service for the item of equipment covered.
 - 3. Operation and maintenance manuals shall include copies of test reports, acceptance certificates and warranty information.
 - 4. In addition to the foregoing, the Contractor shall demonstrate to the Owner's designated personnel the use of the systems listed herein and shall furnish a digital version of a general operation procedure. Include locations and functions of switches, circuit breakers, fuses, etc.
 - 5. After final acceptance of all work and occupancy of the building, the Contractor shall have on the job, a qualified representative to make final adjustments of electrical systems and to instruct the Owner's representative in operating procedures, adjustment, and maintenance of system components, and to acquaint the Owner's representative with locations and functions of circuit breakers, fuses, switches, control devices, etc.
- F. Record Drawings:
 - 1. Refer to Division 1 for submittal requirements.
 - 2. The Contractor shall provide a paper set of construction documents of the building floor plan for the Contractor's use in making a record layout of actual locations of equipment, devices, routing of conduits and locations of pull boxes for the following facilities:
 - a. Electrical feeders to service connection point and branch circuit panels
 - b. All branch circuit wiring
 - c. Voice/data conduit system
 - d. Empty conduits for use by others
 - 3. The information shall be neatly marked and the prints delivered to the Architect.
- G. Contractor's Warranty:
 - 1. All work shall be warranted to be free of defects and to function properly for one year from the date of substantial completion. Defects appearing within the warranty period shall be repaired to the satisfaction of the Architect/Engineer. Refer to Division 1 for additional requirements.
 - 2. The warranty shall not obligate the Contractor for failure resulting from accident or from improper operation or care on the part of the Owner.
 - 3. Warranty for drivers and LEDs shall be as follows: Warranty failure shall be deemed to have occurred when 10% or more of the population of drivers or LED boards have failed. Should this occur, it is necessary that the Owner (or Contractor prior to substantial completion) make timely notification of the Architect/Engineer to facilitate a warranty claim with the manufacturer(s). Any extended warranties offered by Manufacturers shall not be preempted by this warranty.

1.04 BASIC REQUIREMENTS

- A. Before bidding, the Contractor shall diligently study and compare all contract documents and promptly report to the Architect/Engineer any discrepancies or deficiencies discovered by or

made know to the Contractor.

- B. Extended warranties and manufacturer based warranties shall be signed by the warranty holder.
- C. Discrepancies: Whenever a discrepancy or inconsistency exists between related information indicated on the contract drawings and/or specifications (such as differences between product descriptions and catalog numbers) this contractor shall obtain additional clarification and direction from the Architect/Engineer before proceeding. For bidding purposes, this contractor shall include the labor and materials necessary to comply with the alternative that results in the greatest cost to the Contract.
- D. Deficiencies: The Contractor and subcontractors shall resolve all known deficiencies and inadvertent omissions, including non-compliance with applicable codes, with the Architect/Engineer prior to ordering materials or proceeding with the work. Any work performed prior to receipt of instruction from the Architect/Engineer will be done so at the Contractor's risk.
- E. Manufacturer's Catalog Numbers: Product series, model, or catalog numbers, whether indicated on drawings or specifications, shall not be considered complete. This Contractor shall not order any product based solely upon the stated catalog number. Furnish products including accessories and options necessary to match the full product description and its intended purpose and application based on all information available from the contract documents.

1.05 DETAILED REQUIREMENTS

- A. Equipment and material specifications are minimum general requirements.
- B. In cases where construction requirements and/or special features not mentioned are stated in subsequent sections, on the drawings, or by local Code, the higher standard shall apply.
- C. Electrical installations shall not hinder the regular maintenance of or replacement of mechanical equipment. Conduit and cabling shall not be installed beneath suspended mechanical units. Coordinate and plan installations.

1.06 DEMOLITION REQUIREMENTS

- A. This contractor shall visit the site to verify existing conditions and limitation information prior to submitting a bid. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and the scope of work.
- B. Remove existing installations to accommodate new construction on existing project site.
- C. Disconnect and remove wiring and cabling back to source in all areas except where removal requires demolition of finished surfaces that are to remain during new construction. Non-accessible wiring and cabling shall be cut flush to to where concealed in wall or ceiling.
- D. Existing wiring to be removed under this contract within the defined scope of demolition shall be regarded as scrap materials to be recycled by this Contractor. Scrap value shall be determined by the Contractor and accounted for in the Contractor's bid. All other demolished electrical items (e.g., light poles, luminaires, switchgear, etc.) shall be regarded as the Owner's property. The Owner reserves the right to identify which items shall be salvaged-and, thus, carefully removed by this Contractor and placed in storage on site as directed by the Owner. The Contractor shall be responsible for the proper disposal of all demolished materials that the Owner does not want to salvage. Coordinate exact requirements directly with Owner.

- E. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities.
 - 1. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
 - 2. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
 - 3. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

- F. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
 - 1. Ballasts in light fixtures installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide Owner and Architect/Engineer with a Certificate of Destruction to verify proper disposal.
 - 2. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in a permitted hazardous waste disposal facility or by a permitted lamp recycler.

1.07 FACILITATION OF NEW UTILITY SERVICES

- A. Stake all necessary lot lines, lot corners, and building footprints prior to commencement of installations associated with new utility services. Locate and stake all underground facilities such as storm and sanitary sewer, water lines, irrigation systems, underground electric, underground communications, grease traps, mechanical/piping systems, etc. All locates and information from site surveys shall be made available at no cost to each utility company that is providing new and/or relocated services.

- B. Electric Utility Company: The Contractor shall contact the electric utility company and coordinate the installation of a new/relocated electric service. The Owner shall apply for and pay for permanent utility service from the utility company. The Contractor shall coordinate the extent to which the utility company provides service installations and shall include in this Contract any and all scope of work that is regarded by the utility company as Owner/Contractor provided, which shall include all labor and materials as specified by the utility company.
 - 1. Electric Utility Company: Pacific Power Corp.
 - a. Contact Person: Marilyn Brockey
 - b. Phone: 503-338-0836
 - c. Email: marilyn.brockey@pacificcorp.com
 - 2. Coordinate electrical service connections to all components furnished by the electric utility company.
 - 3. Coordinate installation and connections of exterior utilities and services, including provisions for electricity metering components.
 - 4. Comply with requirements of the authorities having jurisdiction, including local, state, and federal regulations.

1.08 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 3. To allow right of way for piping and conduit installed at required slope.
 4. So connecting raceways, cables, and wireways will be clear of obstructions and of the working and access space of other equipment.
- B. Prior to bidding, this contractor shall determine conduit and cabling routings, including the means and methods of installation, maximum feeder/branch-circuit lengths, pull boxes, junction boxes, conduit bodies, fittings, and any other related work in accordance with the contract documents and the applicable building codes.
- C. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

1.09 QUALITY ASSURANCE

- A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."
- B. Tests & Adjustments
1. Contractor shall perform at his own expense, except for electrical energy, any tests that the Architect/Engineer may order to prove the performance of any device(s) and/or equipment supplied under this contract.
 2. Such tests will be limited to non-destructive test and will involve only direct reading(s) of the parameter(s) involved, i.e., actual trip rating or time delay of a circuit breaker may be required but coordination study is beyond the scope of this requirement.
 3. Provide adjustments such as branch circuit re-arranging, circuit breaker trip settings, final selection of fuse sizes, motor starter overload element settings, and the like that may be indicated by the tests and/or to suit equipment to be installed.

1.10 CODES, ORDINANCES, & PERMITS

- A. All governmental codes and ordinances that are applicable and in effect at the time and location of this work are hereby referenced as an integral part of the specification to establish minimum standards of design detail, materials, and workmanship. Extra payment will not be allowed for work or changes required by local code enforcement authorities and/or utility companies. This is not to preclude the establishment of non-conflicting higher standards as may be specified herein and/or indicated on the drawings. In case of conflict between any of the standards established herein and a governmental code or ordinance, refer to the Architect/Engineer and obtain instructions before proceeding with the work involved.
- B. Apply for, obtain, and pay for required permits and certificates of inspection.
- C. Particular attention is directed to:
1. National Electrical Code
 2. Local electric wiring ordinances
 3. Requirements of the electric utility company
 4. IEEE National Electrical Safety Code

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. In all Division 26 Part 2 articles where titles introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified or prior approved product substitution. No product manufacturer will be accepted after this bid unless approved through a contractual change or written acceptance by Engineer. See “Substitutions” article herein.

2.02 PROPRIETARY REFERENCES

- A. Except where there is indication to the contrary, the intent of this specification is to be open to all brand names and suppliers that offer equipment that complies with the stated requirements of capacity, function, quality configuration, size, shape, and operating characteristics that are compatible with the design objectives of the system and interfacing equipment.
- B. Stated requirements are minimum in the case of unit output and maximum in the case of input requirements.
- C. The perceived operational limitations and maintenance requirements as well as the availability of suitable maintenance support will be evaluated in comparison to competing equipment as an important factor in deciding if an item of equipment is acceptable or not acceptable.
- D. The product manufacturers listed are manufacturers that are believed to be producers of like equipment or materials and locally represented, with service capability and otherwise meeting the requirements of the contract documents. Reference to a brand name is not to be construed as a representation that the named supplier actually has available the equipment or materials that meet the detailed requirements of the contract documents.
- E. Details of construction, control, or operation that are proprietary and not significant to the Owner's utilization of the equipment will not be used as a basis for qualifying or disqualifying any equipment.

2.03 SUBSTITUTIONS

- A. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
- B. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Engineer at least 10 days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the work including changes in the work of other contracts that incorporation of the proposed substitution would require shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Engineer's decision of approval or disapproval of a proposed substitution shall be final. Refer to Division 1 for additional requirements.
- C. If the Engineer approves a proposed substitution prior to receipt of bids, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

- D. No substitutions will be considered after the contract award unless specifically provided in the contract documents.

2.04 UL LABEL

- A. All materials, devices, etc. installed under this contract shall bear the UL label, or be UL listed as applicable except those specified items not covered by existing UL Standards.

PART 3 EXECUTION

3.01 BUILDING CONSTRUCTION

- A. Refer to the general construction drawings, which are bound with the drawings of this work, for construction details, elevations, etc.

3.02 INSPECTION OF SITE

- A. Determine information regarding existing construction by the site inspection prior to bidding.
- B. By submitting a bid for this work, contractor agrees they have inspected the existing site and familiarized themselves with existing conditions and how they relate to the contract documents.

3.03 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Examine the site and all the drawings before proceeding with the layout and installation of this work. Verify all door swings and clearances to cabinets, etc. before locating switch and outlet boxes. Locate conduits, boxes, etc., essentially as shown on the drawings, but in exact layout determined on the job to suit actual conditions. Locate work so it does not interfere with access to service for any equipment. Confer and cooperate with other trades on the job so all parts will be installed in proper relationship. Precise location of parts to coordinate with other work is the responsibility of the Contractor.
- B. Obtain and follow manufacturer's installation instructions in the installation of all electrical equipment. Observe all restrictions imposed by the equipment manufacturer, UL label, NEC, or other applicable code in regard to setting; anchoring; hanging; clearances; electric, magnetic or thermal separation; shielding; weather and moisture protection. In case of conflict between the specifications herein and instructions or code governing the installation, notify the Architect/Engineer and receive his instructions before proceeding.
- C. Arrange exposed work as closely as practicable to wall or ceiling surfaces and in accurate alignment with exposed features of structure and/or trim. Locate concealed work so fittings, connectors, and other projections will clear surfaces. Where the option of more than one material is given, selection shall be confined to those which may be properly installed.
- D. Install all work in a neat and workmanlike manner by workmen thoroughly qualified in the trade or duties they are to perform. Rough work will be rejected.
- E. The Contractor is responsible for correct size and location of chases, slots, and openings require and will be liable for any cutting or patching made necessary by his failure to make proper arrangements in this respect.

- F. Maintain a competent full-time superintendent on the job to oversee and coordinate work with other trades, receive instructions from the Architect/Engineer, make layout of work to suit actual conditions, and to satisfy requirements of the drawings, specifications, and good workmanship.

3.04 EXCAVATING & BACKFILLING

- A. Provide excavating and backfilling necessary for installation of this work.
- B. Dig trenches to proper depth, graded for fall and to give solid bearing for each length of conduit or wire. Underground conduit or wire shall not be covered until inspected and the installation approved.
- C. Trenches under the building and under concrete slabs around the building shall be backfilled with mechanically tamped sand to level with surrounding earth. Dirt backfill shall not be used for these trenches.
- D. Sod and/or any surfacing (sidewalks, drives, parking, etc.) shall be replaced and restored to original condition where disturbed by excavations.
- E. Excess earth from the excavations shall be dispersed evenly on the site as directed by General Contractor.
- F. Before starting any excavation, use every reasonable means (examination of drawings, check with local utility companies and completed site work, local inquiry and check of surface indications) to determine the presence of underground piping, wiring, etc. in the area to be excavated. If such are, or are suspected to be existing, obtain instructions from the Architect/Engineer before proceeding.
- G. Refer to Division 31 for additional excavating, trenching and backfilling requirements.

3.05 PAINTING

- A. Exposed electrical work in finished areas, walls, ceilings, etc. will be painted by the General Contractor if the Electrician has the work in place and properly cleaned before the General Contractor's painter starts work. If the Electrician fails to do this, he shall paint such work as directed.
- B. Exposed electrical work in unfinished areas will not require painting unless noted otherwise.
- C. Protect the manufacturer's finish on equipment that is so finished. Clean and/or touch-up as necessary to repair damage at the end of the job.
- D. Paint exposed work installed under this contract with suitable primer and two coats of approved enamel, colors as specified or directed.
- E. Protect the manufacturer's finish on equipment that is so finished. Clean and/or touch-up as necessary to repair damage at the end of the job.

3.06 CLEANING & RUBBISH

- A. During the work, keep the premises clear of unnecessary accumulation of debris.

- B. Plug or cap open ends of conduits to prevent the entrance of dirt and/or moisture during construction. Protect boxes, panel enclosures, etc. against the entrance of mortar, plaster, moisture, and other foreign material during construction, and thoroughly clean these spaces before pulling wires, and again, if necessary, before installing covers of fronts.
- C. On completion of the work, remove all rubbish and debris resulting from the work or the work of subcontractors and dispose of same.
- D. All equipment, fixtures, etc. shall be thoroughly cleaned of accumulated dust, plaster, or other dirt and left in a satisfactory condition for use.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Metal-clad cable.
- E. Wiring connectors.
- F. Electrical tape.
- G. Wire pulling lubricant.
- H. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 07 8400 - Firestopping.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable 2018.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.

- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- J. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- K. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- L. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- M. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- N. UL 854 - Service-Entrance Cables Current Edition, Including All Revisions.
- O. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

1.04 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/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 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. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

PART 2 PRODUCTS

2.01 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. 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 (1.8 m).

2.02 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/ICEA S-95-658.
- 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. 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.
- I. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20A, 120 V circuit longer than 100 ft (30 m): 10 AWG. for voltage drop.
- J. 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. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 240/120 V, 1 Phase, 3 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

2.04 SERVICE ENTRANCE CABLE

- A. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor copper cable listed and labeled as complying with UL 854, Style R.
- B. Conductor Stranding: Stranded.
- C. Insulation Voltage Rating: 600 V.

2.05 METAL-CLAD CABLE

- A. 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.
- B. Conductor Stranding: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.

2.06 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.

2.07 ACCESSORIES

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. 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 (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 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. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among 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. Exposed Cable Installation (only where specifically permitted):
 1. Route cables parallel or perpendicular to building structural members and surfaces.
 2. Protect cables from physical damage.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."
- I. 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.
- J. Install conductors with a minimum of 6-inches (15 cm) of slack at each outlet.
- 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.
- 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.
- 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. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- R. 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.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2022.
- 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.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. 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.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect/Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- F. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Concrete-Encased Electrode(For new service installation):
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
 - 3. Ground Ring (For new service installation):
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of

- not less than 30 inches (750 mm).
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches (600 mm) outside building perimeter foundation.
4. Ground Rod Electrode(s):
- a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- G. Service-Supplied System Grounding:
- 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 - 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. 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.
 - 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 - 8. Provide bonding for exterior metal gas piping systems in accordance with NFPA 70 and gas utility company installation requirements.
- I. Communications Systems Grounding and Bonding:
- 1. Provide bonding jumper in raceway from building grounding electrode system to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: As indicated.

- b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
- c. Ground Bar Size: 1/4 by 4 by 12 inches (6 by 100 by 300 mm) unless otherwise indicated or required.
- d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

2.02 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).
 - b. Where bare copper conductors are used for grounding systems, they shall comply with the following:
 - 1) Solid Conductors: ASTM B 3.
 - 2) Stranded Conductors: ASTM B 8.
 - 3) Tinned Conductors: ASTM B 33.
 - 4) Bonding Cable: 28 KCMIL, 14 strands of No. 17 AWG conductors, 1/4 inch in diameter.
 - 5) Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6) Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7) Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

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. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- 3. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- 4. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Ground Bars:

- 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
- 2. Size: As indicated.
- 3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

- 1. Comply with NEMA GR 1.
- 2. Material: Copper-bonded (copper-clad) steel.
- 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 2 inches (50 mm) below finished grade.
 - 2. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. 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. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - a. Applications:
 - 1) Underground connections (except at test wells and as otherwise indicated).
 - 2) Connections to structural steel.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - a. Applications:
 - 1) Pipe and equipment grounding conductor terminations.
- I. Identify grounding and bonding system components in accordance with Section 26 0553.
- 3.02 Equipment Grounding:
- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- 3.03 Grounding at the Service:
- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.
- 3.04 FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Tests and Inspection: After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
 - a. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 3. Prepare test and inspection reports. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
 - 5. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.
- B. Construction requirements for concrete bases

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- E. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 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.

PART 2 PRODUCTS

2.01 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. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. 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. Comply with MFMA-4.
 2. Channel Material:
 - a. Galvanized steel.
 3. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. 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.
 3. Solid or Grout-Filled Masonry: Use expansion anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps complying with MSS SP-96.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Fasten with lag screws or through bolts.
 9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Strength and support assemblies: where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
 - 2. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
 - 3. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 4. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 5. Use slotted-channel racks attached to substrate to support equipment surface-mounted on hollow stud walls and nonstructural building surfaces.
 - 6. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 7. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000 and as specified in this section.
 - 8. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
 - 9. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.
 - 10. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- 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.

3.02 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Conduit fittings.
- H. Accessories.

1.02 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 for Electrical Systems.
- G. Section 26 0539 - Underfloor Raceways for Electrical Systems.
- H. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
- I. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- J. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- K. Section 27 1000 - STRUCTURED CABLING: Additional requirements for communications systems conduits.
- L. Section 31 2316 - Excavation.
- M. Section 31 2323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.

1.04 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.

PART 2 PRODUCTS

2.01 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 rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use rigid PVC conduit.
 - 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 5. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges.
- D. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- E. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- F. Interior, Damp or Wet Locations: Use intermediate metal conduit (IMC).
- G. Exposed, interior, Located within finished spaces: Use electrical metallic tubing (EMT)
- H. Exposed, Interior, Not Subject to Physical Damage, Located within unfinished spaces(mechanical rooms/storage rooms): Use electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- J. Exposed, Exterior: Use galvanized steel rigid metal conduit.
- K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.
- 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 (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
 - c. Pneumatic Equipment
 - d. Electric Solenoids.
 - e. Hydraulic equipment.

2.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 26 2100.
- B. Communications Systems Conduits: Also comply with Section 27 1000.

- C. Fittings for Grounding and Bonding: Also comply with Section 26 0526.
- D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for the purpose intended.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel.

2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. 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.
- B. 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.

PART 3 EXECUTION

3.01 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. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.
- G. 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. Install raceways square to enclosures and terminate with locknuts.
 - 5. 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.
 - 6. Unless otherwise approved, do not route conduits exposed:

- a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
7. 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.
 8. Arrange conduit to maintain adequate headroom, clearances, and access.
 9. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
 10. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 11. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 12. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 13. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. 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. Support conduits within 12 inches of connected enclosure.
- I. Connections and Terminations:
1. Use approved 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 for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
 8. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- J. 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. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. 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.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- K. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.
 2. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length.
 3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
- L. 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.
- M. 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.
 3. Where conduits penetrate coolers or freezers.
- N. 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 (300 mm) at each end.
- O. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Underground boxes/enclosures.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specifications for Underground Enclosure Integrity 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for floor boxes and underground boxes/enclosures.

- C. 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.
- 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. Keys for Lockable Enclosures: Two of each different key.

PART 2 PRODUCTS

2.01 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 (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 - 12. Minimum Box Size, Unless Otherwise Indicated:
 - a. 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size
 - 13. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - 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 4, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed same as panelboards unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 2. Size: As indicated on drawings.
 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
 4. Provide logo on cover to indicate type of service.
 5. Cover Finish: Nonskid finish shall have minimum coefficient of friction of .50.
 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
 - b. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
 8. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

PART 3 EXECUTION

3.01 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. Mount at heights indicated on drawings. If mounting heights are not individually indicated, 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 so that wall plates do not span different building finishes.
 4. Locate boxes so that wall plates do not cross masonry joints.
 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
- 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. 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. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
 5. Do not support boxes by conduit alone.
- 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 (6 mm) 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 (3 mm) at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Underground Boxes/Enclosures:
1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
 2. Unless otherwise indicated, install enclosure on gravel base, minimum 6 inches (150 mm) deep. Grade base from 1/2-inch sieve to No4 sieve and compact to same density as adjacent undisturbed earth.
 3. Flush-mount enclosures located in concrete or paved areas.
 4. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
 6. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes

for terminating fittings to be used, and seal around penetrations after fittings are installed.

- N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. Provide grounding and bonding in accordance with Section 26 0526.
- R. Identify boxes in accordance with Section 26 0553.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. 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.
- B. Section 27 1000 - STRUCTURED CABLING: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components. Provide unique identification for all branch loads served.
 - a. Panelboards:
 - 1) Use typewritten circuit directory in location provided by panelboard manufacturer to identify load(s) served for panelboards with a door. Identify spares and spaces.
 - 2) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
 - c. Enclosed switches and circuit breakers:
 - d. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
 - e. Enclosed Contactors:
 - 1) Identify load(s) and associated circuits controlled. Include location.
 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
 3. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 2. Identification for Communications Conductors and Cables: Comply with Section 27 1000.
 3. 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.
 4. Use underground warning tape to identify direct buried cables.
- D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.

2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
3. 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. Identification for Communications Devices: Comply with Section 27 1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in areas as directed by Architect, provide identification on inside surface of wallplate. Verify with Architect prior to label application.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use stainless steel or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
2. 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: 1.5 inches (38 mm) by 3 inches (76 mm).
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: 1/2 inch (13 mm).

- b. Equipment Designation: 1/2 inch (13 mm).
- c. Other Information: 1/4 inch (6 mm).
- 5. Color:
 - a. Normal Power System: White text on black background.
- D. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Power source and circuit number or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.

2.03 VOLTAGE MARKERS

- A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- B. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- C. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
- D. Color: Black text on orange background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 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 (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, drawings, shop drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout project.
- C. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Enclosure front.
 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. Boxes: Outside face of cover.
 8. Conductors and Cables: Legible from the point of access.
 9. Devices: Outside face of cover.
- D. Install identification products centered, level, and parallel with lines of item being identified.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Unless labels and nameplates are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
- G. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- H. Install underground warning tape above buried lines with one tape per trench at 6 inch(es) (mm) below finished grade.

- I. Secure rigid signs using stainless steel screws.
- J. Mark all handwritten text, where permitted, to be neat and legible.
- K. Conductors To Be Extended in the Future: Attach write-on tags to conductors and list source.
- L. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- M. Equipment To Be Labeled:
 - 1. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
 - 2. Enclosures and electrical cabinets.
 - 3. Access doors and panels for concealed electrical items.
 - 4. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - 5. Enclosed switches.
 - 6. Enclosed circuit breakers.
 - 7. Push-button stations.
 - 8. Contactors.
 - 9. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Outdoor motion sensors.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. 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.
- E. Section 26 5100 - Interior Lighting.
- F. Section 26 5600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

1.04 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. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 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. Provide lighting plan indicating location, model number, and orientation of each sensor and associated system component.
- D. Field Quality Control Reports.
- E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: Include detailed information on device programming and setup.
- G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all sensors.

PART 2 PRODUCTS

2.01 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.

2.02 OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Refer to drawings and controls schedules for listed manufacturers.
- 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/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.

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. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
7. Sensitivity: Field adjustable.
8. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
9. 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.
10. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
11. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect and Engineer.

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. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - d. 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.
 - e. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

2.03 OUTDOOR MOTION SENSORS

- A. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.
- B. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.
- C. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.
- D. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.
- E. Integral Photocell: For dusk to dawn operation.
- F. Manual Override: Activated by switching power off to unit and then back on.
- G. Load Rating: As indicated on drawings and schedules.

- H. Coverage: As indicated on drawings and schedules.
- I. Finish: As indicated on drawings and schedules.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130.
- 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 (1.2 m) 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 (80 mm) 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.
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- 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. Install and aim sensors in locations to achieve complete coverage. Do not exceed coverage limits specified in manufacturer's written instructions.
- K. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

- L. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 0533.16 for mounting of lighting control device system components.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Inspect each lighting control device for damage and defects.
- D. 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.
- E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.03 ADJUSTING

- A. Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
- B. Adjust devices and wall plates to be flush and level.
- 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.

3.04 CLOSEOUT ACTIVITIES

- A. 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. Instructor: Manufacturer's authorized service representative.
 - 3. Location: At project site.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Load centers.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- 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.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- 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.

- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 67 - Panelboards Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- M. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

1.05 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.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- 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. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 - 7. Include documentation of listed series ratings upon request.
- D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

- 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. Panelboard Keys: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products
- B. Eaton Corporation
- C. ABB/GE
- D. Siemens Industry, Inc
- 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.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

- D. Short Circuit Current Rating:
1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
 2. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 3. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Material: Tin-plated aluminum.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 2. Provide fully rated neutral bus, with a suitable lug for each feeder or branch circuit requiring a neutral connection. Equip with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
1. Material: Tin-plated aluminum.
 2. Terminations shall allow use of 75 deg C rated conductors without derating.
 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- I. 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 4X, stainless steel.
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 3. Fronts:
 - a. Secured to box with concealed trim clamps.
 - b. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - c. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening and cover all live parts with no exposed hardware.
 - d. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and

thermosetting topcoat

4. Height: 84 inches maximum.
 5. Lockable Doors: All doors lockable with locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
1. Percentage of future capacity: Five percent.

2.03 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. Circuit Breakers: Thermal magnetic plug-in type unless otherwise indicated.
- C. Enclosures:
1. Provide surface-mounted enclosures as indicated.
 2. Fronts: Provide 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.

2.04 LOAD CENTERS

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Applications Allowed: Provide load centers only for where indicated by drawings.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 3. Provide circuit directory label on inside of door.

2.05 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.
 - 2) 14,000 rms symmetrical amperes at 480 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. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
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 250 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
- B. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- C. Provide the following circuit breaker types where indicated:
 1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
- D. Do not use handle ties in lieu of multi-pole circuit breakers.
- E. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
- F. Provide the following features and accessories where indicated or where required to complete installation:
 1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 2. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

PART 3 EXECUTION

3.01 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.

3.02 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 support and attachment in accordance with Section 26 0529.
- F. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
- 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 (2000 mm) above the floor or working platform.
 - 1. For required ICC A117.1 accessible load centers and panels, install panels such that the highest position of any operating handle for circuit breakers or switches does not exceed 48 inches (2000 mm) above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.
- J. Provide grounding and bonding in accordance with Section 26 0526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Set field-adjustable circuit breaker tripping function settings as indicated.
- M. Provide filler plates to cover unused spaces in panelboards.
- N. Identification:
 - 1. Identify panelboards in compliance with Section 26 0553 and provide the following:
 - a. Identify field-installed conductors, interconnecting wiring, and components; install warning signs.
 - b. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
 - c. Panelboard Nameplates: Label each panelboard with a nameplate.
 - d. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate.
 - e. Install warning signs identifying source of remote circuit.

3.03 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 and circuit breakers larger than 100 amperes. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, 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.
 - 1. Measure loads during period of normal facility operations.
 - 2. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.

3.05 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

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

1.02 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 for Electrical Systems.
- 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.
- F. Section 27 1000 - STRUCTURED CABLING: Voice and data jacks.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.

- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interruption Current Edition, Including All Revisions.

1.04 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 the placement of outlet boxes for wall switches with actual installed door swings.
 - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
 - 1. Wall Dimmers: Include derating information for ganged multiple devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. Provide weather resistant GFCI receptacles with specified weatherproof in use covers for receptacles installed outdoors or in damp or wet locations.
- C. Provide tamper resistant receptacles.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles installed in commercial kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: Gray with galvanized steel wall plate, Verification during submittal process.
- C. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

2.03 Source Limitations

- A. Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.04 Product Grade:

- A. Switches: Unless indicated otherwise, Commercial specification grade.

2.05 WALL SWITCHES

- A. 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.
- B. Standard Wall Switches: 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.

2.06 RECEPTACLES

- A. 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.
- B. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: 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.
- C. 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.
 - 2. Standard GFCI Receptacles: duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: 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.

2.07 WALL PLATES

- A. 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.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section. Unless otherwise indicated, measurements are to center line of device.
 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: +48" above finished floor.
 - b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter where indicated.
 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 3. Where multiple receptacles or wall switches 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 (80 mm) 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. Conductors:
 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
4. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
5. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
 - d. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
- 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. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.
- I. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- M. 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.
- N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- O. Identify wiring devices in accordance with Section 26 0553.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
 1. Line voltage: Acceptable range is 105 to 132 V.
 2. Ground Impedance: Values of up to 2 ohms are acceptable.
 3. Voltage Drop: Under 15A load, a value of 6 percent or higher is unacceptable.

- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
 - 1. Test for tripping values specified in UL 1436 and UL 943
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.
- G. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete

3.03 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, and outdoor photo controls.
- D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- E. Section 26 5600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.
- B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.
- C. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.
- D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 1598 - Luminaires Current Edition, Including All Revisions.

1.04 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. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 2. 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.
- 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. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
- G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting) and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

- B. Provide five year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. 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.
- E. 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.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Support all fixtures independently from ceilings and ceiling support systems.
- G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.02 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.03 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.

END OF SECTION

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Poles and accessories.

1.02 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 for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information 2019.
- B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.
- C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 1598 - Luminaires Current Edition, Including All Revisions.
- H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. 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, 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.
 - 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.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. 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.
- E. 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.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- H. 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.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.

- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Install accessories furnished with each luminaire.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Install lamps in each luminaire.

3.02 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.

3.03 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

END OF SECTION

SECTION 27 0000
GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Division 27 Specifications are provided to define the standards and criteria to be used to bid, plan, furnish, install, test, and document communication systems for Broadway Field Seaside. These specifications shall form the basis for implementation of the procurement, installation, inspection, and close-out process.
- B. Division 27 has been designed and developed based on NFPA 70 (NEC), National Electrical Safety Code (NESC), Institute of Electronic and Electrical Engineers (IEEE), and a combination of ANSI/TIA Telecommunication Standards, and BICSI methodologies. The requirements within those documents are not superseded herein unless specifically stated. NEC and NESC code requirements are unable to be superseded by this document at any time. ANSI/TIA standards and BICSI methodologies are guidelines and recommendations for best practices and may be superseded, as specified, or may be made more stringent by this document.
- C. Any use of the word “shall” marks a mandatory requirement. Use of the word “may” or “should” suggests optional elements. All conflicts within this document shall be resolved by the General Contractor in consultation with the Design Team. The standards of Broadway Field Seaside shall take precedence in the resolution of any dispute.
- D. Unauthorized changes and/or deviations from these specifications, regardless of scale, may result in re-design, reconstruction, or re-installation of communications elements at the contractor’s expense. Contractors shall obtain formal written approval prior to bidding and prior to installation in order to deviate from these specifications or from ANSI/TIA standards and BICSI methodologies. Contractors shall not deviate from NEC and NESC requirements.
- E. Division 27 Specifications address information transport pathways, multiple different types of communication systems, spaces, media, grounding, identification, testing, and documentation requirements in support of multiple information transport infrastructures.
- F. Specific responsibilities of Division 27 include, but are not limited to:
 - 1. Installation of the intra-building pathways, cabling, and coordinating space requirements necessary to house the communication systems and associated electronic information transport equipment. Pathways and spaces shall be provided to support the known systems and cabling requirements, as well as provisions for those that may be required in the future for growth purposes.
 - 2. The procurement and installation of each communications system and the associated components and cabling to create a fully functional system.
 - 3. Thorough testing shall be conducted of each individual communications system to illustrate compliance with specific performance requirements.
 - 4. Definition and establishment of administration and labeling schemes, conforming to Owner’s requirements.
 - 5. Securing all necessary permits and licenses, payment of all fees, and provision of all construction work notifications.
 - 6. Compliance with all applicable laws, ordinances, rules, and regulations.

7. Mandatory project manager attendance at a weekly project status meeting with the General Contractor.
8. It is the intent of the project drawings and specifications to provide complete and fully functional Division 27 communication systems, ready for use. Any item, not specifically shown in the project drawings or called for in the project specifications but normally required for a complete system, is to be considered a part of this contract.

G. System Continuity:

1. Reconnect all existing items that remain in use. Provide all materials and labor required to retain continuity of existing circuits or systems that are disrupted by these alterations even though not indicated on the drawings.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 & 01 Specification Sections, apply to this Section.
- B. The following documents shall also be considered as a part of and shall relate directly to this section:
 1. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS.
 2. Section 27 4100 - AUDIO-VISUAL SYSTEMS.

1.03 ABBREVIATIONS AND ACRONYMS

- A. The following definitions are applicable to the work as indicated and as shown herein:
 1. ADA: Americans with Disabilities Act
 2. AFF: Above Finished Floor
 3. ANSI: American National Standards Institute
 4. ASTM: American Society for Testing & Materials (ASTM International)
 5. AWG: American Wire Gauge
 6. BTU: British Thermal Unit
 7. dB: Decibel
 8. dBmV: Decibel Millivolt
 9. EIA: Electronic Industries Association
 10. EMC: Electromagnetic Compatibility
 11. EMI: Electromagnetic Interference
 12. EMT: Electrical Metallic Tubing
 13. FCC: Federal Communications Commission
 14. Freq: Frequency
 15. HVAC: Heating, Ventilation, and Air Conditioning
 16. Hz: Hertz
 17. IMC: Intermediate Metal Conduit
 18. IEEE: Institute of Electrical and Electronics Engineers
 19. ISO: International Organization for Standardization
 20. LCD: Liquid Crystal Display
 21. MHz: Megahertz
 22. NEC: National Electrical Code, NFPA 70
 23. NESC: National Electric Safety Code
 24. NFPA: National Fire Protection Association
 25. NRTL: Nationally Recognized Testing Laboratory
 26. OSHA: Occupational Safety and Health Administration

27. PR: Pair
28. RFI: Radio Frequency Interference
29. RH: Relative Humidity
30. RMC: Rigid Metallic Conduit
31. RNC: Rigid Non-Metallic Conduit
32. UL: Underwriters Laboratory
33. UPS: Uninterruptible Power Supply
34. WAP: Wireless Access Point

1.04 DEFINITIONS

- A. The following definitions are applicable to the work as indicated and as shown herein:
 1. Conduit Chase Pipe: Short section of bushed EMT conduit with sufficient size and capacity to support horizontal cabling bundles from ceiling space, through ceiling tile, onto the ladder tray system connecting wall to rack or cabinet.
 2. Design Team: A group of individuals comprised of Architect(s) and Engineer(s) involved in assembling the contract documents known as the drawings and specifications.
 3. J-Hook: A supporting device for horizontal cables that is shaped like a “J”. It is attached to some building structures. Horizontal cables are laid in the opening formed by the “J” to provide support for cables.
 4. Minor Pathway Support Hardware: Anchors, support brackets, clamps, clips, cable ties, D-rings, rack screws, velcro straps and etc. used to dress and secure cabling, conduits and surface raceways.
 5. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.05 CODE REFERENCES AND STANDARDS

- A. All work shall be in compliance with the following codes and agencies. Nothing contained within these specifications shall be misconstrued to permit work not in conformance with the most stringent of applicable codes and standards. It is assumed that bidders have access to, and specific knowledge of, the listed reference materials in order to ensure conformity with them.
 1. National Electrical Code (NEC)
 2. National Electrical Safety Code (NESC)
 3. National Fire Protection Association (NFPA)
 4. International Building Code (IBC)
 5. Federal, State, and Local Codes.
 6. National Electronic Manufacturer’s Association (NEMA)
 7. Institute of Electronic and Electrical Engineers (IEEE)
 8. American National Standards Institute/ Industries Association Telecommunication/ Electronic Industries Association (ANSI/TIA/EIA)
 9. Occupational Safety & Health Administration (OSHA)
 10. Federal Communications Commission (FCC)

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of the telephone and internet service provider pathway and entrance with the Electrical Contractor and the Owner's selected carrier.
- B. Sequencing: Ensure that any wide area network, telephone service, and internet service connectivity cutover is achieved in a coordinated and orderly manner.

- C. All Division 27 Contractor Project Managers shall schedule and conduct a coordination meeting with Broadway Field Seaside Information Technology Department to confirm and coordinate scope of work requirements prior to commencement of work. Project meetings shall be scheduled through the General Contractor.

1.07 SUBMITTALS

- A. Refer to Division 1 for exact submittal procedures.
- B. The Division 27 Contractor shall provide for review, without exception prior to material acquisition and installation, the following items. Failure to submit required items shall disqualify the bidder.
 - 1. Product Data Sheets (Catalog Cuts)
 - 2. Backbone Diagram
 - 3. Riser Diagram
 - 4. Cabling Diagram
 - 5. System Schematics
 - 6. Signal Flow Diagram
 - 7. Dimensioned plans, sections and elevations and fabrication details.
 - 8. Specification Sheets for Test Equipment
 - 9. Bill of Materials
 - 10. Contracting Firm Qualifications and Certifications
 - 11. Installation Team Qualifications by Individual
 - 12. Current Manufacturer Certifications
- C. Provide prior to completion:
 - 1. Cable data base listing patch panel station cable assignments. Database shall be provided on compact disc or other electronic media format when requested by the General Contractor, Broadway Field Seaside or the Design Team. Database shall be submitted to the requesting party within seven (7) calendar days.
 - 2. Cable administration drawings, as requested to assist in the planning process. Drawings will be requested prior to final documentation.
- D. Provide at completion of each construction phase area:
 - 1. Cable test and certification reports; summary hard copy or full test results on digital media when requested by the owner or design team. Reports shall be submitted to the requesting party within seven (7) calendar days.
 - 2. One (1) set of record drawings of the actual installation of the Division 27 systems. Drawings shall be given as full size originals and on digital media in AutoCAD format
- E. Provide at final completion Closeout Submittals. This shall consist of three (3) bound sets of O&M (Operating and Maintenance) Manuals formatted as defined by Division 1 and one (1) electronic copy provided on digital media. Each copy of the O&M Manual shall include, at minimum, items listed as follows:
 - 1. Cable test and certification reports; summary hard copy and full test results on digital media. Test results shall be delivered at the completion of each project phase and at any time when called for by the Owner.
 - 2. Provide one (1) full-size hard copy set of record drawings (as-builts) to be submitted to the Design Team for approval, immediately upon completion of the installation.
 - 3. Instruction manuals including equipment and schedules, operating instructions, and manufacturer's instructions.

4. Manufacturer Warranty Certificate.
 - a. Warranty contacts including but not limited to names, telephone numbers (office and mobile).
5. Networked Devices
 - a. Provide the owner a list of all networked devices including all IP addresses and passwords for devices and managing software.

1.08 QUALITY ASSURANCE

- A. Contracting firm shall constitute a company with a minimum of five (5) years successful installation experience with projects utilizing infrastructure and systems work similar to that required for this project.
- B. Service Qualifications: Installing and servicing contractor shall have a permanent office within a 120-mile radius of the project site.
- C. Work crew, not involved in installing cable elements (e.g. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathway elements) do not require BICSI or manufacturer certification or registration.
- D. Contractor shall provide a Manufacturer Certification for the system solution bid, issued directly in the bidder's company name, valid for the time frame in which the installation will be completed. Contractor shall be manufacturer certified in order to participate in the bid event.
- E. The contractor shall be knowledgeable in local, state, regional, and national codes and regulations. All work shall comply with the latest revision of codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall apply.
- F. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific solution being installed.
- G. Only installers trained and certified by the proposed manufacturer shall be allowed to install firestop products.
- H. Before bidding, the contractor shall study and compare all contract documents and promptly notify the Design Team of any discrepancies or deficiencies discovered by or made known to the contractor.
- I. Discrepancies: Whenever a discrepancy or inconsistency exists between related information indicated on the contract drawings and/or specifications, this contractor shall obtain additional clarification and direction from the Design Team before proceeding. For bidding purposes, this contractor shall include the labor and materials necessary to comply with the solution that results in the greatest cost to the contract.
 1. If there is a conflict between applicable documents, then the more stringent requirement shall apply.
 2. The failure to question any controversial item will constitute acceptance by the bidder who shall execute it to the satisfaction of the owner after being awarded the contract.
- J. Deficiencies: The contractor and associated subcontractors shall resolve all known deficiencies and omissions, including non-compliance with applicable codes, with the Design Team prior to ordering materials or proceeding with the work. Any work performed prior to receipt of instructions from the Design Team will be done so at the contractor's risk.

1. If mention has been omitted pertaining to details, items or related accessories required for the completion of any system, it is understood such item and accessories are included in the contract. After the contract is awarded, claims based on insufficient data or incorrectly assumed conditions, or claims based on misunderstanding the nature of the work, will not be recognized.
2. All devices, symbols and work illustrated shall be new work provided under this contract except work labeled existing to remain and equipment labeled to be furnished (or supplied) by others but installed by this contractor.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Equipment, materials, and supplies shall be shipped, handled and stored in ways that shall prevent damage to the items.
- B. All items shall be handled and stored as recommended by the manufacturer.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under manufacturer's specified conditions, and free from damage or deterioration.
- D. Equipment, materials, and supplies to be incorporated in the area of work shall be new unless otherwise specified.
- E. Equipment, materials, and supplies shall be produced in a good workmanlike manner.
- F. When the quality of a material, process, or article is not specifically set forth in the Drawings or Specifications, the best available quality of the material, process, or article shall be provided.

1.10 PROJECT CONDITIONS

- A. Conditions and Measurements: Visit the jobsite to verify installation conditions and confirm measurements for all required systems and associated cabling connectivity.

1.11 WARRANTY

- A. The Contractor shall submit, in the bid documents, any additional contractor-specific warranties or guarantees to be offered on the project.
- B. The Contractor shall supply any and all necessary documentation needed to process and record the warranty(s) and to verify the installation solution.
- C. Data Cabling System Warranty
 1. All cabling systems shall include a minimum twenty-five (25) year application assurance warranty as a manufacturer registered system installation. During the warranty period, and for non-conformities of which contractor has notice, contractor shall take all necessary and appropriate action; free of charge, to correct any non-conformity with the warranties contained in the manufacturer agreement. During the warranty period, contractor shall provide to the Owner, free of costs and charges, all support necessary to ensure that the cabling system meets the requirements specified in this document and performance guarantees provided by the contractors. During the warranty period, contractors shall furnish, or cause to be furnished, all maintenance, service, parts and replacements necessary to maintain the cabling system in good working condition, at no cost to the Owner.

2. The contractor shall supply a full manufacturer's application assurance warranty for all new installations, to include approved termination hardware and cabling media from the proposed manufacturer's list of approved materials. Services to be provided by this contractor to the Owner during the warranty period shall include, without limitation, the following:
 - a. Remedial Maintenance
 - 1) Contractor shall provide service on the Owner's site as necessary including, but not limited to, fault isolation, diagnosis, and repair.
 - b. Maintenance Records
 - 1) Contractor shall maintain, at the jobsite, a current record of the cabling system configuration.
 - c. Replacement Parts
 - 1) Contractor shall provide and install replacement parts, including new components.
- D. All Other Communications Systems Warranty
1. Unless listed elsewhere within these specifications, a warranty shall be provided for a minimum of one (1) year for all other communications systems listed. One year shall begin from the date of Substantial Completion. This warranty shall cover both product and service to address remedial maintenance and replacement parts as is appropriate to keep each system complete and fully functional.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. If a Bidder proposes to Substitute an article, device, material, equipment, form of construction, fixture, or item other than the approved manufacturers and part numbers, listed and named in the Specifications, the Bidder shall certify that the proposed item is equal in quality and all aspects of performance and appearance, to the items specified. The Bidder shall submit a request for Substitution to the Design Team by following the instruction in Specification Section 01 6000, which must include:
 1. The name and complete description of the proposed Substitution including Drawings, performance and test data, and other information necessary for a complete evaluation; and
 2. A statement setting forth any changes that the Proposed Substitution will require in the Contract Documents or the project.
- B. If the Design Team approves the Proposed Substitution, the Design Team shall issue an Addendum. If the Design Team does not approve the substitution, the Design Team shall inform the Bidder of its decision, which is final. The Design Team may reject a proposed Substitution because the Bidder failed to provide sufficient information to enable the Design Team to completely evaluate the Proposed Substitution without causing a delay in the scheduled bid opening.
 1. Proposed Substitutions received by the Design Team after the allotted time allowed by Section 01 6000 shall not be considered.
- C. Bidder shall confirm all reference part numbers, listed within Division 27, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.
 1. All materials associated with reference parts shall be included so as to constitute a complete and functional system, whether or not specifically identified and itemized.

2.02 ASSEMBLIES

- A. Sleeves and Pathways for Cabling:
 - 1. Where additional conduits are needed beyond those shown on the drawings to accommodate the installation of systems cabling, this contractor (Division 27) shall include such provisions in this contract. Provide conduit suitable for its application and sized in accordance with industry standards. Include nylon bushings at conduit ends and firestopping as required around conduits wherever building barriers are penetrated. If necessary, this contractor shall hire a qualified contractor to perform this work.

PART 3 - EXECUTION

3.01 CLEANING

- A. Division 27 Contractor shall thoroughly clean all assemblies within the telecommunications room's space before they are turned over to the Broadway Field Seaside IT Services for operation. Cleaning shall include, but not be limited to, all ladder tray, racks and wire managers (both inside and out), copper and optical fiber panels (both inside and out). Should any telecommunications room or closet be completed prior to the balance of the floor space construction that it serves, racks, cabinets, and wall frames shall be covered with plastic sheeting to repel dust and other contaminants to which they will be subjected.
- B. At the end of each workday or shift, the Contractor shall be required to clean-up the work area and remove all construction debris such that the site is clean and usable without hazard to workers.

3.02 PROJECT CONDITIONS

- A. The Owner shall not be responsible for delays in work because of shutdowns due to unsafe working practices by Contractors.
- B. The active information transport system and cabling associated with specific work beyond the construction area shall not be disrupted at any time.
- C. Contractor shall clean work areas each day and remove debris properly and legally from the project site. Materials and supplies stored for use in the project shall be neatly stacked outside the circulation areas. All exits and paths shall be cleaned so as to prevent dirt from being tracked into the site.
- D. It shall be the responsibility of the Contractor to secure any parking permits prior to the first day of work on-site.
- E. Work outside of normal operating hours and days shall be coordinated with Broadway Field Seaside.

3.03 SAFETY REQUIREMENTS

- A. All contract work shall be performed in accordance with the policies, procedures, and standards established by the Owner.
- B. In construction areas, all Contractor personnel shall wear personnel protection devices, as deemed appropriate by the General Contractor and as required by OSHA for the work location

and work operation being performed. Devices shall include, but not be limited to hardhats, work boots, safety eye protection, reflective vests, etc.

- C. All exposed holes, pits, pipes, etc., either inside or outside the project site, shall be barricaded or plated and adequately secured when Contractor personnel are not present. All ladders, hanging wires, pipes, and other items protruding at a pedestrian level travel way must be removed or secured following the final shift of the day.
- D. During breaks or when only a portion of work has been completed, tools shall not be left exposed where others may risk injury or attempt to use them. Windows and doors shall not be left unsecured or propped open during breaks. At the completion of the final shift each day, doors, windows, or other openings shall be adequately secured.
- E. When driving on the Owner's property, Contractor personnel shall observe all traffic safety regulations and pay particular attention to pedestrians. All loose material and debris on vehicles shall be adequately secured and tied down.

END OF SECTION

SECTION 27 0528
PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit and fittings.
- B. Wireways and auxiliary gutters.
- C. Hooks.
- D. Junction Boxes
- E. Devices Boxes
- F. Enclosures, and cabinets.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The following documents shall also be considered as a part of and shall relate directly to this section:
 - 1. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
 - 2. Section 27 4100 - AUDIO-VISUAL SYSTEMS

1.03 ABBREVIATIONS AND ACRONYMS

- A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.04 DEFINITIONS

- A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.05 CODE REFERENCES AND STANDARDS

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.06 SUBMITTALS

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.07 QUALITY ASSURANCE

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 2 PRODUCTS

2.01 CONDUIT AND FITTINGS

- A. Approved Manufacturers:
 - 1. Allied Tube & Conduit
 - 2. Western Tube & Conduit Corp.
 - 3. Wheatland Tube Company
 - 4. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
- B. Conduit types:
 - 1. EMT shall be steel, hot-dipped galvanized or electro-galvanized, with an inner coating to protect cables and aid pulling, UL listed, and meeting the requirements of UL 797 and ANSI C80.3.
 - 2. RMC shall be steel, hot-dipped galvanized inside and outside with factory threaded ends full cut and galvanized after threading, UL listed, and meeting the requirements of UL 6 and ANSI C80.1.
 - 3. RNC shall be PVC Schedule 40 rigid plastic unless otherwise noted on the Drawings, shall be rated for use with 90 degree C wire, and shall conform to UL 651, WC-1094C and NEMA TC2.
 - 4. Flexible (flex) conduit: Flex conduit is not approved and not acceptable. Where, in rare instances, flex conduit is the only remaining viable option, the Contractor shall notify the Engineer and await the Engineer's direction prior to procurement and installation.
 - 5. Conduit bodies (LB's): Conduit bodies (LB's) are not approved and are not acceptable.
- C. Fittings:
 - 1. Provide fittings as follows:
 - a. EMT fittings shall be steel compression type with a nylon insulated throat for rain-tight and concrete-tight applications, steel set screw type or steel compression type for all other connections. Conduit ends shall be fitted with bushings - bushings shall be threaded type for RMC and IMC, set screw type for EMT, and have a nylon insulated throat.
 - b. RMC fittings shall be threaded galvanized steel. Conduit ends shall be fitted with bushings - shall be threaded and have a nylon insulated throat.
 - c. RNC fittings shall be of same material and manufacturer as the conduit and shall be UL listed and conform to UL 514.
 - 2. Expansion fittings shall be provided across structural joints, shall be of a design to compensate for expansion and contraction, and shall be sealed to prevent entrance of water and moisture, and shall safely deflect and expand up to twice the distance of the

- structural movement. Expansion fittings shall be approved for grounding duty.
3. Minimum Trade Size:
 - a. Communication systems conduit: 1 inch.
 - D. Joint Compound for EMT, RMC, or RNC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 WIREWAYS AND AUXILIARY GUTTERS

- A. Approved Manufacturers:
 1. Pentair/Hoffman
 2. Cooper B-Line
 3. Hubbell
 4. Thomas & Betts
 5. Hellermann Tyton
 6. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
- B. Wireway and Gutter types:
 1. Metal gutter shall be sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.
 2. Non-metallic gutter shall be fiberglass polyester or PVC, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless steel screws and oil resistant gaskets
- C. General Requirements for Wireways and Auxiliary Gutters:
 1. Wireways shall comply with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 3. Comply with TIA-569-D.
- D. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: Hinged cover unless otherwise indicated.
- F. Finish: Manufacturer's standard finish.
- G. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 JUNCTION BOXES

- A. Approved Manufacturers:
 1. Hubbell/Raco
 2. Garvin Industries
 3. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

- B. Junction boxes shall be provided to serve as a transition point between pathways/raceways. Junction boxes shall be galvanized stamped steel, deep drawn one piece (without welds or tab connections), with knockouts for conduit entrances, meeting NEMA OS 1.
- C. Junction boxes shall not be placed in non-accessible ceiling locations unless specifically shown on the Communications Construction Drawings or approved in writing by the Engineer prior to rough-in and installation.
- D. Junction boxes in locations other than walls shall be sized according to the NEC.
- E. Junction boxes in walls:
 - 1. Unless otherwise shown on the Drawings, junction boxes shall be 4-11/16 inch by 4-11/16 inch by 2-1/8 inch deep with blank cover, and knockouts pre-manufactured to support the conduit size serving the junction box.
 - 2. Size according to the NEC and provide the larger of the minimum size mentioned above or the NEC requirements.

2.04 DEVICE BOXES

- A. Approved Manufacturers:
 - 1. Hubbell/Raco
 - 2. Garvin Industries
 - 3. Substitutions: See Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
- B. Device boxes shall be galvanized stamped steel, deep drawn one piece (without welds or tab connections), with knockouts for conduit entrances, meeting NEMA OS 1, and equipped with extension rings to suit construction and application.
- C. Device Box Types:
 - 1. Device Box: Typically installed as an empty box with faceplate, conduit and pull string for future use, unless specifically noted otherwise on the Communications Construction Drawings.
 - a. Shall be a minimum 4-11/16 inch by 4-11/16 inch by 2-1/8 inch deep capable of accepting a minimum of (2) 1 inch conduits.
 - b. Shall be equipped with a minimum single-gang mud ring unless otherwise noted on the Drawings.
 - c. Provide a blank faceplate to match the material, style and color being used on the Electrical Wiring Devices
 - 2. Outlet Box: Outlet boxes shall be provided to house Communications System outlets and connectors. Unless otherwise noted in the Communications Construction Drawings the typical Outlet Box(es) shall be as follows:
 - a. Shall be a minimum 4-11/16 inch by 4-11/16 inch by 2-1/8 inch deep capable of accepting a minimum of (2) 1 inch conduits.
 - b. Shall be equipped with a minimum single-gang mud ring unless otherwise noted on the Drawings.
 - c. Provide a cover plate in lieu of a single-gang mud ring at Wireless Access Point locations.

2.05 ENCLOSURES, AND CABINETS

PART 3 EXECUTION

3.01 PATHWAY APPLICATION

- A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: RNC, Type EPC-80-PVC.
 - 2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

- B. Indoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT, RNC, Type EPC-40-PVC, or innerduct.
 - 5. Damp or Wet Locations: GRC.
 - 6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, communications cable pathway.
 - 7. Pathways for Optical-Fiber or Communications Cable Risers in Vertical Shafts:Riser-type optical fiber cable
 - 8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical fiber cable pathway.
 - 9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and commercial kitchens and damp or wet locations.

- C. Minimum Pathway Size: 1 inch trade size for communications cables .

- D. Pathway Fittings: Compatible with pathways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use set-screw, steel fittings. Comply with NEMA FB 2.10.

- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

- F. Install surface pathways only where indicated on Drawings.

- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

- A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA/BICSI 568.
 - 3. TIA-569-D.
 - 4. NECA 101
 - 5. NECA 102.
 - 6. NECA 105.
 - 7. NECA 111.
- B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- C. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- D. Comply with requirements in Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.
- E. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- F. Complete pathway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.
- I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- J. Support conduit within 12 inches of enclosures to which attached.
- K. Pathways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
 - 3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed thread-less fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from nonmetallic conduit and fittings to RNC, Type EPC-40-PVC and fittings before rising above floor.
- L. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

- N. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- P. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.
- Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.
- R. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- S. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.
- T. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.
- U. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- W. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC that is located where environmental temperature change may exceed 100 deg F, and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Hooks:
1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
 2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
 3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
 4. Space hooks no more than 5 feet o.c.
 5. Provide a hook at each change in direction.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- DD. Set metal floor boxes level and flush with finished floor surface.
- EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS
- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 27 0544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING.
- 3.04 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.05 PROTECTION
- A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 4100
AUDIO-VISUAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Work of this Section includes labor, materials, equipment and services necessary to complete the provision of audio-visual raceways, cable and related work indicated on the communications drawings, details and specified in this Section.
- B. Work includes, but is not necessarily limited to, the following:
 - 1. Provision of audio-visual system equipment, back boxes, faceplates, conduit, stub ups, and as indicated on the communications drawings.
 - 2. Supply and installation of all cable to be provided.
 - 3. Provision of Shop Drawings and samples as required herein.
 - 4. Verification of dimensions and conditions at job site prior to equipment installation and coordination with associated trades.
 - 5. Field coordination at job site.
 - 6. As-Built record drawings.
 - 7. Owner Training
- C. Any additional materials or services needed in order to meet the general requirements stated above, even if not specifically mentioned herein or on the drawings, shall be provided by the Contractor without claim for additional payment. If the drawing and specifications conflict in any regard, the specifications or drawings that illustrate the highest value of material and/or labor shall take precedence.
- D. Related Work: The following related items are specified in other Sections of the Specifications:
- E. General provisions for Electrical work - Applicable sections of Division 26.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The following documents shall also be considered as a part of and shall relate directly to this section:
 - 1. Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS
 - 2. Section 27 0528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

1.03 ABBREVIATIONS AND ACRONYMS

- A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.04 DEFINITIONS

- A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.05 CODE REFERENCES AND STANDARDS

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.06 SUBMITTALS

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.07 QUALITY ASSURANCE

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Reference Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

1.09 WARRANTY

- A. Comply with Section 27 0000 - GENERAL REQUIREMENTS FOR COMMUNICATIONS SYSTEMS

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All raceways and related equipment shall be provided as per applicable sections of Division 26, the Drawings and in accordance with the National Electrical Code.
- B. All conduits shall be concealed.
- C. All equipment shall be installed in accordance with manufactures recommendations.
- D. All materials and components shall be new and of manufacturer's finest quality as appropriate to the application. Uniform materials and components shall be used throughout, and wherever possible, shall be field replaceable and commonly available.
- E. All materials shall conform to applicable UL standards and to general electrical requirements.
- F. See applicable sections of Division 26 for more information.
- G. Audio Visual Cabling:
 - 1. Cable required for interconnection between system equipment shall be provided for a complete and operating system.

2. This Contractor shall verify appropriateness of system cable and quantity indicated on the drawings prior to installation of equipment and receptacle plates.
3. All portable cable, connectors for cable provided by others and required adapters that connect fixed receptacle panels to loose or fixed equipment will be furnished by this Contractor.
4. Provide permanent cable identification tags for all cable used in the system. Cable numbers shall be noted in as-built shop drawings.

2.02 PRODUCTS

A. Wall and Ceiling Receptacle Boxes

1. Receptacle boxes, where located on the drawings for audio visual raceway system, shall be in accordance with NEMA/EEMAC, UL 50 Type 1 and IEC 529, IP30.
2. Boxes shall be fabricated from 16-gauge or 14-gauge steel. All boxes shall be provided with cover plates for flush mounting except where otherwise noted. Knockouts for conduits shall be as required to meet conduit sizes indicated on plans.
3. Typical device back box shall be the number of gangs as called for on the legend, 2-1/8" deep unless otherwise noted.
4. Provide knockouts as required for accommodate specified conduit size.

B. Acceptable Manufacturers:

1. RACO, Leviton, Steel City, Hubbell, or As Approved.
2. See electrical specification for additional requirements.

C. **See drawings for list of audio-visual equipment.**

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to the Architect for correction.
- B. Commencement of work will be construed as complete acceptance of preparatory work by others.
- C. All devices shall be installed as per applicable sections of Division 26 and in accordance with the Electrical Code.

3.02 GENERAL REQUIREMENTS

- A. Contract Drawings are diagrammatic and indicate general arrangement of systems and work included. Verify exact location of all electrical devices with architectural drawings. If a dimension is not indicated on either the architectural or communications drawings, request in writing, required information prior to proceeding. Any work installed without written direction that is not specifically indicated on the drawings may be rejected and relocated at Contractor expense. All finish or other work by others damaged by relocation of any electrical device shall be the responsibility of the Contractor.
- B. Final location of all equipment shall be located as shown on Contractor's reviewed Shop Drawings, or as located in the field by the Architect, or as shown on supplementary drawings prepared by the Consultant. Check drawings of other trades relating to work to verify spaces in

which work will be installed. In centering outlets and locating boxes allow for overhead pipes, ducts and mechanical equipment, variations in fireproofing and plastering, window and door trim, paneling, hung ceilings, and the like, and correct any inaccuracy resulting from failure to do so without expense to Owner.

3.03 RACEWAYS

A. General Requirements:

1. No exposed raceways shall be permitted.
2. Pull no wire; insert no fish wire, until raceway and outlet boxes are permanently in place.
3. Provide cable supports for wire in riser conduits as required by code, if applicable.
4. Provide pull boxes in horizontal conduit running every 100 feet as indicated or wherever necessary to facilitate pulling in of wire. Coordinate locations with other trades to provide access.
5. PVC or flexible conduit shall be not be permitted.
6. All conduit penetrations through acoustically rated partitions shall be a maximum of 1/2" larger than the penetrating conduit and shall be thoroughly caulked with acoustical non-setting caulk.
7. Provide drag lines with conduit destination noted on drag line to facilitate pulling of cable.
8. No MC shall be permitted for AV conduit.

B. Raceway Grounding & Isolation

1. Signal conduits shall be mechanically and electrically connected to receptacle boxes and shall be electrically isolated from audio-visual system equipment racks.
2. Provide terminals of conduits with lock nut and insulated bushing for connection to pull boxes servicing more than one conduit subsystem as described in the separation Guide Identification table below.

C. Separation of Signal Raceways

1. Microphone level circuits, line level circuits, loudspeaker circuits, video, digital communication lines (including lighting control) and telephone lines shall be run in separate conduits. All conduits shall be installed per the table below. If not physically possible to provide the separation specified for parallel runs over 25', the exterior of the signal conduit with the lowest voltage shall be completely wrapped in 1/32" thick lead sheet. Where it is absolutely necessary to cross a conduit with a conduit where separation is called for, the intersection shall be at 90 degrees and the audio conduit shall be wrapped in 1/32" lead sheet for a distance of 12" each side of the intersection.

D. The following table shall be used as a guide for the minimum separation required between signal conduits.

1. Group Identification

- a. Microphone conduit (0mV-100mV)
- b. Line level conduit (100mV-10V)
- c. Loudspeaker conduit (10V-70.7V)
- d. Telephone, video and digital communication conduit

Group	a.	b.	c.	d.
a.	-	6"	12"	12"
b.	6"	-	12"	6"
c.	12"	12"	-	6"
d.	12"	6"	6"	-

- 2. Group Identification
 - a. Dimmer controlled lighting circuits
 - b. Power circuits (120V and above)
 - c. Plumbing Pipe
 - d. Heat sources

Group	a.	b.	c.	d.
a.	24"	12"	6"	12"
b.	24"	12"	6"	12"
c.	12	12"	6"	6"
d.	12"	12"	6"	6"

3.04 WORKMANSHIP

- A. The installation of all work shall be neat. All boxes, equipment, etc., shall be plumb and square.
- B. Following installation, all soiled, abraded or discolored surfaces of work installed herein will be cleaned and left free from blemishes or defects.
- C. Work that is damaged or improperly installed will be removed and replaced and the entire installation left in complete satisfactory condition.
- D. Any damage brought about by Contractor's work shall be repaired by the Contractor at no cost to the Owner.

3.05 SYSTEM TESTS AND ADJUSTMENTS

- A. Initial tests and adjustments shall be performed by the audio-visual contractor who shall include the cost of these tests in his bid proposal. He shall furnish all equipment necessary and perform all work required to determine or modify the performance of the system in accordance with the specifications. Audio visual contractor shall carry out the following inspections of the system and submit to the Consultant the written results at each inspection for inclusion on the permanent records of the sound system.
- B. Verify signal flow through the entire system.
- C. Precisely adjust color, contrast and settings and calibrate display technology.
- D. Control shall be adjusted for optimum signal to noise ratio and signal balance.
- E. Video System:
 - 1. Operate display technology with NTSC video and data sources from all input locations to demonstrate proper operation and adjustment.
 - 2. Color balance for projectors shall be established with the use of a meter.
 - 3. Align images to eliminate any keystoneing and for smooth and consistent focus.
 - 4. Demonstrate remote video control functions from remote control panels.

3.06 DUST PROTECTION AND CLEANING

- A. Provide dust protection of all equipment installed at the project site. Dust protection shall be provided in the form of plastic sheeting or other approved method for all equipment and material provided herein until Final Acceptance. It is the responsibility of this contractor to provide daily cleaning of equipment and control room with a vacuum regardless of whom is responsible for dust.

- B. Fixed loudspeakers shall be covered at all times until Final Acceptance.
- C. Following Installation, all soiled, abraded or discolored surfaces of work installed herein shall be cleaned and left free from blemishes or defects.
- D. Work that is damaged or improperly installed shall be removed and replaced and the entire installation left in complete satisfactory condition.
- E. Clean the areas affected by the Work to a level of operational cleanliness. Dispose of protective covering material and debris accordingly.

3.07 FINAL ACCEPTANCE TESTING

- A. Contractor shall demonstrate operation of each component of the systems to the Consultant, Construction Manager and Owner's representative until acceptance is granted.
- B. In case the need for further adjustments becomes evident during the demonstration and testing, Contractor's work shall be continued until the systems operate properly.
- C. When Final Acceptance testing has concluded to the Owner and Consultant's satisfaction, Contractor shall submit a written request for Final Acceptance. Guarantees, warranties and service contracts will commence upon written notification of Final Acceptance by the Architect.

3.08 Intellectual property ownership

- A. All supporting documentation, programming, uncompiled source code, graphic files, DSP code and diagrams, written and electronic files, including all latest versions of the documentation and software necessary to edit and adapt the system(s), shall be provided to the Owner for all spaces and all systems. The integrator and/or programmer shall also maintain a current copy to be provided at the Owner's request.
 - 1. The Owner shall have the right to modify the intellectual property directly, or to have the intellectual property modified by any party of the Owner's choosing.

3.09 INSTRUCTION

- A. Within two working weeks of system acceptance, the Contractor shall commence a series of training sessions for persons designated by the Owner.
- B. A total of (6) six hours of training, at mutually acceptable times, shall be provided during a two-week period.

END OF SECTION