



GENERAL CONTRACT FOR

**CAMPUS FOR
STUDENT SUCCESS
MULTIPURPOSE ROOM
RENOVATIONS**

**Newport News Public Schools
Newport News, Virginia**

PROJECT MANUAL

Quinn Evans Project No. 56406380

**October 1, 2025
Issued for Bid**

IFB #011-0-2026/SB



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PROJECT MANUAL

CAMPUS FOR STUDENT SUCCESS MULTIPURPOSE ROOM RENOVATION

NEWPORT NEWS, VIRGINIA

IFB #011-0-2026/SB

PROJECT ADDRESS

Campus for Student Success
746 Adams Drive
Newport News, Virginia 23061

OWNER

Newport News Public Schools
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Newport News, Virginia 23606

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STRUCTURAL ENGINEERING

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MECHANICAL, PLUMBING, ELECTRICAL ENGINEERING

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Hampton, VA 23666
Phone: 757-599-4415

October 1, 2025

SECTION 000200

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**SECTION 011000
SUMMARY**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 PROJECT

- A. Project Name: Campus for Student Success – Multipurpose Room Renovation.
 - 1. Project Location: 746 Adams Drive, Newport News, Virginia, 23601, United States.
 - 2. The building formerly known as South Morrison Elementary School.
- B. Owner's Name: The School Board of Newport News Public Schools, 12465 Warwick Boulevard, Newport News, Virginia, 23608, United States.
 - 1. Owner's Representative: Stephen Smith, Facilities Project Manager.
 - 2. Plant Services 12580 Patrick Henry Dr. Newport News, VA 23602
 - 3. Phone: (757) 881-5024, Ext. 14129 Email: stephen.smith@nn.k12.va.us
- C. Architect's Name: Quinn Evans - Richmond, 1840 West Broad Street, Suite 400, Richmond, Virginia, 23220.
 - 1. Architect's Representative: Jack Hasten, jack.hasten@quinnevens.com.
- D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents.
 - 1. Contractor will notify the Architect if communications and coordination efforts require involvement of Architect's Consultants.
 - 2. Geotechnical and Construction Special Inspections Services: Schnabel.
 - a. Representative: TR Fluker, TFluker@schnabel-eng.com.
 - 3. Structural Engineer: Dunbar Structural.
 - a. Representative: Jackie Miller, jmiller@dunbarstructural.com.
 - 4. Mechanical, Electrical, Plumbing and Fire Protection: Thompson Consulting Engineers.
 - a. Representative: Jason Minor, jaminer@tceva.com.
- E. Web-Based Project Software: Architect will utilize web-based project software for purposes of managing communication and documents during the construction stage.
 - 1. See Section 013100 - Project Management and Coordination Management and Coordination" for requirements for use of web-based Project software.

1.03 DESCRIPTION OF WORK

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. This project consists of renovations to an existing Gymnasium and Stage in a single-story building of approximately 4,420 S.F., within the existing Campus for Student Success (formerly South Morrison). This project includes interior alterations as designed for these spaces and within the adjacent corridor. Interior work demolishes the existing stage, alters existing load-bearing and non-load-bearing masonry walls and partitions, and provides lintels for new openings, fire-rated HM storefronts and glass. Work includes interior demolition, provision of new interior trim, doors and frames, finishes, ceilings, folding panel walls with structural support, plumbing, HVAC, lighting and electrical work.
 - 2. All work shall be constructed in accordance with the 2021 Virginia Existing Building Code (VEBC). The existing school is unsprinkled.
- B. The scope of work includes the Base Bid delineated in the Contract Drawings and Specifications. Allowances and Unit Prices shall be included in the Base Bid.
- C. Furnish all labor and materials to construct the project as indicated on the Contract Documents. Work includes, but is not limited to, the following:

1. Layout of the work.
2. Construction access.
3. Coordination with subcontractors, inspectors, City and other agencies.
4. Coordination with testing laboratories as designated in the documents.
5. Renovation of the proposed areas.
6. Cleanup and disposal of all construction materials and debris.

1.04 SCHEDULE

- A. The Work shall be in accordance with the following schedule:
 1. The Contractor shall commence work in the field upon receiving a Notice to Proceed from the Owner, not later than December 10, 2025, and shall work expeditiously to complete this project with minimal interference to the Owner and its operations.
 2. Substantial Completion: All work shall be substantially complete and ready for the Owner's use not later than August 7, 2026.
 3. Final Completion: All work shall be achieved not later than September 7, 2026.
 4. Delivery of O&Ms, warranties and as-built drawings shall be achieved not later than September 18, 2026.
- B. The Work described above shall be considered part of the total Project. Separate contracts and/or work by the Owner's forces may supplement the Work of this Contract to produce a completed facility for the Owner's use.
- C. The Contractor shall have access to the site commencing with the Notice to Proceed in order to take measurements and prepare for the Work.

1.05 WORK BY OWNER

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

1.06 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.
- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 1. Furniture, Furnishings, and Loose Equipment: A separate contract will be awarded to acquire and install furniture and loose equipment not included in the base bid.
 2. HVAC Controls Work: Connection to the building's energy controls and monitoring system shall be performed by Honeywell.
 3. Data/I.T. Systems: Above-ceiling telecommunication and audio-visual system cabling, data systems and devices, including, but not limited to speakers, monitors and supports, wireless network transmitters, data outlets and faceplates, shall be by Newport News Public Schools I.T. staff or associated vendors.
- C. Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to substantial completion of the Work, provided such occupancy does not interfere with the completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.07 CONTRACTOR USE OF SITE AND PREMISES

- A. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

- B. Attention is called to the fact that this facility is a public school and all necessary precautions shall be taken to ensure the continuous safety of the staff, students and visitors occupying the facility during work that could be completed after occupying the site and building.
- C. Full Owner Occupancy: Cooperate with the Owner during construction to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.
- D. Burial of construction waste on the site is prohibited. Remove from the site of the project any rubbish and debris resulting from the construction work of this contract. The Contractor shall keep the premises clean to minimize damage and to minimize hazards to workers.
- E. Existing Systems that Must Remain Operational during Course of the Work: The entire facility/school shall remain in use and fully operational throughout the school year. All mechanical and electrical systems shall remain in use and fully functional throughout this period. The Owner may permit limited preparatory work inside the existing, occupied parts of the building after hours (6:00 PM- 6:00 AM), subject to prior approval.
- F. In general, areas will be made available immediately adjacent to the building for the storage of materials and work may be carried on between the hours of 6:30 AM and 9:00 PM.
- G. The Contractor shall have limited areas at the site designated by the Owner for its use and staging. The Owner shall designate parking for the Contractor's personnel and subcontractors' use during the work. Access to the site shall be gained from the driveway at the north side of the school and through the north courtyard.
- H. Closure of the School with No Indoor Work Permitted: The school shall be closed on December 22, 2025 – January 2, 2026, January 19, 2026, February 16, 2026, May 25, 2026, June 19, 2026, and July 3, 2026 in observance of holidays, with no indoor access. Thus, no indoor work may be performed on those days. Exterior work that does not require indoor access will be permitted.

1.08 ACBM MATERIALS

- A. The existing building is known to contain limited hazardous materials, within the work area under this contract. **Newport News Public Schools is responsible for abating all known asbestos-containing materials prior to commencement of work under this contract.** If any additional suspicious materials are encountered, immediately notify the Owner's representative, who will expedite investigation and determination of any hazard(s).
- B. This project shall be free from all new asbestos containing building materials. The Contractor shall submit certification at the completion of the project that no asbestos containing materials have been used in the construction.

1.09 LEAD-FREE CERTIFICATION

- A. All new construction shall be free from lead-containing building materials. The Contractor shall submit certification at the completion of the project that no lead-containing materials have been used in the construction.

1.10 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- C. Nonsmoking Building: Smoking is not permitted within the building or within 50 feet of entrances, operable windows, or outdoor-air intakes. Persons found smoking, vaping or chewing tobacco may be removed from the construction site.

- D. Smoking and Controlled Substance Restrictions: Use of Drugs and/or alcoholic beverages, and other controlled substances on Project site on Owner's property is illegal and not permitted.
- E. Possession, Display or Use of firearms, tasers, crossbows, knives, nunchucks or other weapons, including arrows and ammunition, is illegal on Owner's property and severely punishable. This shall not apply to construction tools ordinarily employed in the type of work performed under this contract.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Accident Prevention and Safety: Comply with all applicable laws, ordinances, rules, regulations and orders of governing authorities having jurisdiction for the safety of persons and property to protect them from damage, injury or loss.
 - 1. Contractor is solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Project.
 - 2. Comply with AGC's "Manual of Accident Prevention in Construction" in addition to accident prevention and safety requirements of applicable codes, ordinances, and statutes.
 - 3. Erect and maintain, as required by conditions and progress of the work, necessary safeguards for safety and protection, including fences, railings, barricades, lighting, posting of danger signs and other warnings against hazards.
 - 4. Build scaffolds and other temporary facilities in accordance with all requirements of local, state and Federal laws and regulations.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.12 MISCELLANEOUS PROVISIONS

- A. The Contractor shall protect the existing facility and grounds at all times during the course of construction. Any damages caused or patching needed as a result of their activities shall be

repaired at no additional cost to the Owner. In general, patching, repair, and renovation work is intended to match, compliment and align with existing conditions.

- B. The Contractor is to maintain the structural integrity of the existing building at all times. At no time is the removal or demolition of a structural element to occur without the approval of the Owner.
- C. The Contractor must have a minimum of five (5) years' experience and must have completed three (3) projects of a similar size and scope within the past three (3) years. Immediately after identifying the apparent low bidder that Contractor shall submit the names, addresses and phone numbers of the contact person, for each of these similar projects. These references may be used in determining the most qualified bidder irrespective of the low bid.
- D. Contractor shall not have access to the existing building's lounges, vending machines, restrooms or telephones for its use in the existing building. See Section 015000 for Temporary Facilities requirements.
- E. Fraternization between construction workers and building occupants is strictly prohibited.
- F. Construction workers shall not use restrooms in an occupied facility.
- G. Construction workers shall not consult with building occupants regarding any issue of a construction nature except as necessary in emergency situations.
- H. Use of vulgar, suggestive or abusive language or gestures is strictly prohibited on this project property.
- I. The Owner's dumpsters are not for construction debris.
- J. Construction workers will be properly dressed at all times. This includes the wearing of shirts and pants worn properly (pulled up to waist).
- K. Contractor is responsible for protection and safekeeping of Products under this Contract stored at Project site or remotely.
- L. Contractor shall move stored Products, under Contractor's control, which interfere with operations of the Owner.
- M. Contractor shall, at his option, obtain and pay for the use of additional storage or work areas needed for operations.
- N. No hoisting shall be allowed over the occupied portion of buildings when the building is occupied.
- O. Possession or Use of Drugs and/or Alcohol is illegal on Owner's property and severely punishable.
- P. Condition of the Existing Building and Grounds: The Contractor will be responsible for maintaining the building in a weathertight condition throughout the construction period and repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. Any damages caused to the Owner's property or property of any of the Owner's employees as a result of the Contractor's operations shall be repaired to the condition before the damage occurred, at the Contractor's expense.
- Q. The existing facility is located in a predominantly suburban area. The Contractor and its personnel shall at all times conduct the work so as to be cognizant and respectful of the school's students, faculty, staff and administration, businesses, residences and families. Do not create undue noise or nuisances during course of the work. All contractor-owned, subcontractor-owned and labor force personally owned vehicles, plus all delivery vehicles, shall be operated in a safe and lawful manner on streets and nearby areas, aware of children playing. Excessive noise, vulgar language by workers, or otherwise inappropriate behavior while on City or School Board property will not be tolerated and may be cause for removal of personnel from the project site. Contractor shall take care to identify construction entrance and observe/ maintain conditions that promote safety for all vehicles entering/existing the site.

1.13 FEES AND PERMITS

- A. Unless otherwise provided in the Contract Documents, the Contractor shall apply for and obtain all public permits, unless noted otherwise. Such permits include:
 - 1. Building permit
 - 2. Plumbing permit
 - 3. Mechanical permit
 - 4. Electrical permit
 - 5. Site/Land Disturbance permit (if required)
 - 6. Site Erosion & Sediment Control Permit (if required)
- B. The City of Newport News will forgive the permit cost for the permits they issue.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 012100
ALLOWANCES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
- C. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.03 DEFINITIONS

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.04 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.05 ACTION SUBMITTALS

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

1.06 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.07 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. **The Contractor shall include in the Total Base Bid all allowances stated in the Contract Documents.**

- D. Whenever costs are more or less than allowances, the Total Bid shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect the difference between actual costs and the allowance.

1.08 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Provide a lump sum allowance of **\$150,000.00 for audio/visual systems** including sound and video systems within the renovated area to form a complete system. The Base Bid includes all rough in conduit, junction boxes and 120V power where required. The Owner will provide additional descriptions of the systems and equipment to be provided. Allowance shall include the cost of installation and may include electrical work and other associated trades.
- B. Allowance No. 2: Provide a lump sum allowance of **\$50,000.00 for data and telecommunications cabling** to include data, voice, video, audio/video cabling to form a complete system. The Base Bid includes all rough in conduit, junction boxes and 120V power where required. The Owner will provide additional descriptions of the systems and equipment to be provided. Allowance shall include the cost of installation and may include electrical work and other associated trades.

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.03 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.04 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form acceptable to Architect.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - h. Research reports evidencing compliance with building code in effect for Project, from Virginia Uniform Statewide Building Code 2018.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitutions 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.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. 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.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 15fourteen days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.05 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES

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

1.07 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Requested substitution provides sustainable design characteristics that specified product provided.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SUBSTITUTION REQUEST FORM - AFTER RECEIPT OF BIDS

Contractor requests for substitutions will be considered upon receipt of the completed Substitution Request Form below along with all required supporting documentation. Substitutions made without completion of this form shall be returned to the Contractor.

SUBSTITUTION REQUEST FORM

PROJECT: _____

SUBSTITUTION REQUEST NO.: _____ DATE: _____

Description: _____

Section Number: _____ Page: _____ Paragraph: _____

The undersigned Contractor request 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 a description of changes to the Contract Documents that the proposed substitution will require for its proper installation. The undersigned Contractor certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned Contractor 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 affect 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 Contractor further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Subcontractor Approval: Firm: _____ Address: _____ Signature: _____ Date: _____	Contractor Approval: Firm: _____ Address: _____ Signature: _____ Date: _____
Architect/Engineer: ☐ No Exceptions Taken ☐ Submit Specified Item ☐ Furnish as Corrected ☐ Revise and Resubmit ☐ Rejected Signature: _____ Date: _____	Owner Approval: Signature: _____ Date: _____

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.03 MINOR CHANGES IN THE WORK

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

1.04 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 14 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect form provided as part of web-based Project management software.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.05 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.06 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.
- B. **Contractor shall not proceed with any work that will incur charges beyond what is included in the Original Contract Price of this job without written authorization by the Owner, or such method of approval as the Owner shall deem acceptable.** The Contractor shall obtain written approval or notice to proceed any proposed change orders or extra-cost work before commencing such work. If the Contractor fails to obtain such authorization, or commences extra work without Owner's approval, the Owner will be under no obligation to pay for such work.

1.07 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012900
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
 - 2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.03 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than 14 days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least two line items for each Specification Section to include adequate breakdown of materials and labor costs for ease and convenience of evaluation and recommendation for action.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets or on forms approved by the Owner.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and for project closeout activities including Maintenance and Operations manuals, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
 - 4. Provide material and labor line items for scope.
 - 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and

- stored, but not yet installed. If acceptable to the Owner and Architect, provide evidence of insurance and bonded warehousing for products stored away from the site.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PAYMENTS

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
- B. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- C. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
 1. Submit electronic copy of the Draft Application to Architect and Owner 24 hours in advance of project progress meeting at which draft application is to be reviewed. Architect, Owner and Contractor will review application at the progress meeting. Adjustments as necessary to ensure funds requested are commensurate with the progress of the work will be made by the Contractor subsequent to the review. Upon review and approval by the Architect, the Application shall be submitted to the Architect for certification.
- D. Payment Application Forms: Use AIA Document G 702 and Continuation Sheets G 703 as the form for Application for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours.
 1. Transmit 4 copies of supporting documentation as required by the General Conditions.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Report of preconstruction conference.

10. Certificates of insurance and insurance policies.
11. Copies of Building Permits.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Completion of items specified for completion after Substantial Completion.
 2. Evidence of completion of Project closeout requirements.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Evidence that claims have been settled.
 5. Final, liquidated damages settlement statement.
 6. Assurance that Work not complete and accepted will be completed without undue delay.
 7. Transmittal of required Project construction records to Owner.
 8. Proof that taxes, fees and similar obligations have been paid.
 9. Removal of temporary facilities and services.
 10. Removal of surplus materials, rubbish and similar elements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings and modeling.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.03 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.
- C. Newforma: Architect's Project Management / Web Portal Software used for electronically transferring project data between Owner, Architect and Contractor.

1.04 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities, list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in each built facility. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

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

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

1.06 COORDINATION DRAWINGS AND MODELING

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, mechanical, plumbing, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:

- a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated elements.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings.
 - b. DWG, Version 2025, operating in Microsoft Windows operating system.
 2. File Submittal Format: Submit or post coordination drawing files using PDF format.
 3. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.
 - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 - b. Sequence: Submit related shop drawings for review prior to start of coordination modeling. Should submittals be returned as revise and resubmit, modeling may occur simultaneously with review period where scheduling is a concern. Reviewer is not responsible for any rework that may be required to correct work done for coordination purposes.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in Revit version 2025.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.07 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
 3. Time and materials of the design professional(s) required to respond to unnecessary, unwarranted, or frivolous RFIs will be paid for by the Contractor.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
 2. Owner name.
 3. Name of Architect.
 4. Date.
 5. Name of Contractor.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and with reasonable promptness return it. Allow 7 days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response. Notifications shall provide specific information identifying potential impacts related to the RFI response. Non-specific, generic response will not be considered notification.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number, including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.

8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.08 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model or CAD drawings will be provided by Architect for Contractor's use during construction.
 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Digital Drawing Software Program: Contract Drawings are available in Revit 2025.
 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
- B. Web-Based Project Management Software Package: The Architect shall provide and administer a web-based Project management software platform for purposes of hosting and managing Project communication and documentation until Final Completion.
 1. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via Architect's Newforma Project Center platform that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - a. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 - b. Contractor and Architect are required to use this service.
 - c. It is Contractor's responsibility to submit documents in allowable format.
 - d. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
 - e. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 - f. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 - g. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
 2. Submittal Service: The selected service is: Web-based project software service listed above.
 - a. Newforma Project Center: www.newforma.com/our-solutions/constructex/#sle.
 3. Training: Architect will provide one, one-hour, web-based training session if requested by Contractor, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
 4. Project Closeout: Architect will determine when to terminate the service for the project.

- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.09 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Sustainable design requirements.
 - o. Preparation of Record Documents.
 - p. Use of the premises.
 - q. Work restrictions.
 - r. Working hours.
 - s. Owner's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.
 - v. Procedures for disruptions and shutdowns.
 - w. Construction waste management and recycling.
 - x. Parking availability.
 - y. Office, work, and storage areas.
 - z. Equipment deliveries and priorities.
 - aa. First aid.

- bb. Security.
- cc. Progress cleaning.
- 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 - 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned

- parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of sustainable design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site use.
 - 10) Temporary facilities and controls.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.

- 14) Field observations.
- 15) Status of RFIs.
- 16) Status of Proposal Requests.
- 17) Pending changes.
- 18) Status of Change Orders.
- 19) Pending claims and disputes.
- 20) Documentation of information for payment requests.
- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

1.4 SUBMITTALS

- A. Submittals Schedule: Submit electronic copies of submittal schedule. Arrange the information in a tabular format.
- B. Preliminary Construction Schedule: Submit two opaque copies.
- C. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated. Include type of schedule (Initial or Updated) and date on label.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each Phase and Subphase as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 5 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.

- c. Uninterruptible services.
 - d. Use of premises restrictions.
 - e. Provisions for future construction.
 - f. Seasonal variations.
 - 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Fabrication.
 - b. Installation.
 - c. Tests and inspections.
 - d. Adjusting.
 - e. Placement and startup of building equipment and building systems.
 - 6. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Permanent connection of services and utilities.
 - f. Substantial Completion.
 - E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
 - F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.
 - G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.
- 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)
- A. General: Prepare network diagrams using AON (activity-on-node) format.
 - B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
 - C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Use "one workday" as the unit of time. Include list of nonworking days and holidays

incorporated into the schedule.

- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Fabrication.
 - d. Utility interruptions.
 - e. Installation.
 - f. Work by Owner that may affect or be affected by Contractor's activities.
 - g. Testing and commissioning.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Description of activity.
 2. Immediate preceding and succeeding activities.
 3. Early and late start dates.
 4. Early and late finish dates.
 5. Activity duration in workdays.
 6. Total float or slack time.
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions.

7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within [one] <Insert number> day(s) 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 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each monthly payment meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

**SECTION 013300
SUBMITTAL PROCEDURES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 5. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 6. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 7. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.03 DEFINITIONS

- A. Newforma: Architect's Project Management / Web Portal Software used for electronically transferring project data between Owner, Architect and Contractor.
- B. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- C. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.04 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 - 3. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.

- d. Name of subcontractor.
- e. Description of the Work covered.
- f. Scheduled date for Architect's final release or approval.
- g. Scheduled dates for purchasing.
- h. Scheduled date of fabrication.
- i. Scheduled dates for installation.
- j. Activity or event number.

1.05 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Contractor.
 - 5. Name of firm or entity that prepared submittal.
 - 6. Names of subcontractor, manufacturer, and supplier.
 - 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 - 8. Category and type of submittal.
 - 9. Submittal purpose and description.
 - 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Indication of full or partial submittal.
 - 13. Location(s) where product is to be installed, as appropriate.
 - 14. Other necessary identification.
 - 15. Remarks.
 - 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.06 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 - 2. Paper Transmittal: For items requiring color selection, include paper transmittal, including complete submittal information indicated.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
5. Color Selection: In individual specification sections, specific items are identified which require color/finish selections to be made by the Architect from color chart or sample submittals. The Submittal Schedule, prepared according to "Submittal Schedule" paragraph above, shall identify these required color/finish submittals. The Architect will make coordinated selections of colors/finishes for the building interior, present the resulting color concepts to the Owner for approval, and prepare the actual Color Schedule for the Work.
 - a. Submittals requiring color selection must be submitted by Contractor and approved by Architect for conformance with Contract Documents prior to the start of the color selection process. When the submittals have been approved for conformance with Contract Documents, the process for color selection, presentation of color concepts, Owner approval, and Color Schedule preparation will begin.
 - b. After approval of all interior color related submittals for conformance with Contract Documents, the Contractor shall allow a minimum of thirty (30) days for the color selection, Owner's approval process, and preparation of the Color Schedule.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. Submittals received after 1:00 PM EST will be considered as to being received the next business day. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If an intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow calendar 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow calendar 21 days for initial review of each submittal.
 - a. Interior product and material finish color selections: allow 30 days from the date of the last material color submittal to Architect for final color package selection.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.07 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
 - 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 - 3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected. Electronic submittals for color, pattern, texture, or similar characteristics are not acceptable.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.

6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
 1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
 4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
 5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
 6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.08 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file copies of certificate, signed and sealed by the responsible design professional licensed in the State of Virginia, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.09 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as follows:
 - a. Approved.
 - b. Approved as Noted
 - c. Revise and Resubmit
 - d. Rejected
 - e. Returned Without Review / Received for Information Only
 2. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to the appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 013310 – CADD / ELECTRONIC FILE TRANSFER AGREEMENT

To (User): **(Contractor's or Sub-Contractor's Name)**

Project: **CAMPUS FOR STUDENT SUCCESS Multipurpose Room Renovation**

Project No: **52406380**

Owner: **Newport News Public Schools**

Architect: **Quinn Evans and consultants**

- 1.1 Architect's electronic files are compatible with Architect's current version of Autodesk REVIT 2025 and AutoCAD. Architect makes no representation as to the compatibility of these files with User's files, hardware, or software.
- 1.2 Data contained on these electronic files are part of Architect's Instruments of Service, and Architect reserves all rights to the original files. These electronic files shall not be used by User or anyone else receiving this data through or from you for any purpose other than for review and as a reference in User's preparation of drawings for the referenced project and are provided as a courtesy. Any other use or reuse by User or by others will be at User's sole risk and without liability or legal exposure to Architect. User agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against Architect, and Architect's officers, directors, employees, agents, or sub-consultants that may arise out of, or in connection with, User's use of the electronic files.
- 1.3 **The use of these electronic files will save the User considerable time and expense in the coordination and management of this project, which represents good and valuable consideration for the following indemnification and release: User agrees, to the fullest extent permitted by law, to indemnify and hold Architect and Architect's officers, directors, employees, agents or sub-consultants harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of, or resulting from, User's use of these electronic files.**
- 1.4 These electronic files distributed at multiple times over the duration of the project do not constitute the Contract Documents for this project. Differences may exist between these electronic files and corresponding hard-copy documents. The Architect makes no representation regarding the accuracy or completeness of the electronic files you receive. It shall be User's sole responsibility to compare the electronic files and corresponding hard-copy documents to ensure the accuracy and completeness of the electronic files.
- 1.5 Because information presented on the electronic files can be modified, unintentionally or otherwise, Architect reserves the right to remove all indicia of ownership and / or involvement from each electronic display.
- 1.6 The electronic data on the storage media provided to User can deteriorate or become corrupted over a period of time. Therefore, User agrees to review the electronic files, within ten (10) days of receipt of such, to determine their accuracy and / or completeness. User shall

immediately notify Architect of any corrupted files, at which time we shall replace the file.
Architect reserves the right to charge a service fee if notified after the ten (10) day period.

- 1.7 Under no circumstances shall delivery of the electronic files for use by User be deemed a sale by Architect, and we make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall Architect be liable for any loss or profit or any consequential damages as a result of users use or reuse of these electronic files.
- 1.8 The Architect will provide electronic files of plan views only. It is the not intent of this Section to provide electronic files other than plan views. **(List Sheet / Drawing Titles).**
- 1.9 User understands and accepts these terms and conditions for the use of the electronic files.

Signed: _____ Date: _____

(Name & Title)

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED REQUIREMENTS

- A. Section 014100, "Special Inspection Services" for third-party special inspection testing and inspecting services in accordance with Chapter 17 requirements of the 2021 Virginia Construction Code.

1.03 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections outlined in Section 014100, "Special Inspection Services".

1.04 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.05 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.06 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.07 ACTION SUBMITTALS

- A. Mockup Shop Drawings:
1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.

2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.08 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- D. Permits, Licenses, and Certificates: For Owner's record, 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.

1.09 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 30 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 1. Project quality-control manager may also serve as Project superintendent .
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or

defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.10 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. 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, telephone number, and email address 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 of whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement of whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

1.11 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.12 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 - 1. 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.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspection 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.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- C. Manufacturer's Technical 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.

- D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- E. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
 - 1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 - 2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- F. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

1.01 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.
 - 1. Submit log at Project closeout as part of Project Record Documents.

3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

**SECTION 014100
SPECIAL INSPECTION SERVICES**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY:

- A. This Section includes administrative and procedural requirements for Special Inspection services.
- B. Certain structural components of the Project will be subject to the requirements for Special Inspections. Special Inspections will be applicable to the following specification sections:
 - 1. Section 032000 Concrete Reinforcing
 - 2. Section 033000 Cast-In-Place Concrete
 - 3. Section 042000 Unit Masonry
 - 4. Section 051200 Structural Steel Framing
- C. The Owner will procure and bear all costs of the Special Inspector and the Independent Testing Laboratory, except as otherwise noted. The Special Inspector will be the manager of the Special Inspection process. The Special Inspector checks the certification of all other inspecting agents required by Special Inspections and coordinates their activities. The Special Inspector carries the exclusive responsibility for assuring that the inspections indicated are performed. The Statement of Special Inspections will be required by the Building Official as a condition for building permit issuance.
 - 1. The cost of retesting and reinspection of construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
- D. Requirements for Special Inspections are outlined in the Statement and Schedule of Special Inspections included on the Construction Documents.
 - 1. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- E. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Quality Control" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

1.03 RESPONSIBILITIES:

- A. Contractor Responsibilities: Contractor shall provide and include in the Contract Sum, inspections, tests, and other similar quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction except where they are specifically indicated to be the Owner's responsibility or are provided by another identified entity.
 - 1. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
 - a. The Contractor shall correct deficiencies in work that inspections and laboratory test reports have indicated to be not in compliance with requirements.
 - b. The cost of retesting and reinspection of construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

2. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - a. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - a. Provide access to the Work.
 - b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 - c. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 - d. Provide and maintain for the sole use of the Special Inspector or Special Inspectors adequate facilities for safe storage and proper curing of test samples on the Project Site.
 - e. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 - f. Provide security and protection of samples and test equipment at the Project Site.
 - g. The Contractor shall designate a representative (the superintendent or an assistant to the superintendent) who shall be the direct point-of-contact with the Special Inspector during each phase of the work. Discrepancies noted during the progress of the work will be reported to the Contractor's representative for corrective action. Communications given by the Special Inspector to the Contractor's representative shall be as binding as if given to the Contractor.
- B. Special Inspector Responsibilities:
1. The Special Inspector shall conduct and interpret tests, state in each report whether test specimens comply with requirements, specifically state any deviations therefrom, and record work required and performed to correct deficiencies.
 2. The Special Inspector will keep records of all inspection and tests which will be furnished to the Building Official, the Architect, and the Structural Engineer of Record.
 3. The Special Inspector shall notify the Architect, Structural Engineer of Record and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services. All discrepancies will be brought to the immediate attention of the Contractor for correction. If discrepancies are not corrected, the discrepancies will be brought to the attention of the Building Official and the Structural Engineer of Record.
 - a. A final report documenting completion of all required special inspections and corrections of any discrepancies noted will be submitted to the Building Official by the Special Inspector prior to, and as a condition of, issuance of the Certificate of Use and Occupancy.
 - b. The Special Inspector shall not perform any duties of the Contractor.
 - c. The Special Inspector shall not release, revoke, alter, decrease or increase the Contract Document requirements.
- C. Independent Testing Laboratory Responsibilities: The Independent Testing Laboratory engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the Laboratory's duties. The Laboratory shall provide qualified personnel to perform required inspections and tests.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Shall not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
- D. Coordination: The Contractor and each agency engaged to perform inspection, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.04 SUBMITTALS:

- A. The Special Inspector and the Independent Testing Laboratory shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.05 QUALITY ASSURANCE:

- A. Qualification for Special Inspector: The Special Inspector shall be a Registered Professional Engineer, Licensed in the State of Virginia, experienced in performing special inspections and shall be approved by the Building Official and the Architect. The credentials of all Inspectors and testing technicians shall be provided if requested.
- B. Qualifications for Independent Testing Laboratory: Engage independent inspection and testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.
 2. Each independent Inspection and Testing Agency engaged on the Project shall demonstrate that it has the experience and capability to conduct the required field and laboratory testing without delaying the progress of the work. The minimum requirements shall be as follows:
 - a. Reinforced Concrete Testing
 - 1) ACI-CFTT Concrete Field-Testing Technician – Grade 1
 - 2) ACI-LTT Laboratory Testing Technician – Grade 1 or 2 and Strength Testing Technician
 - 3) NICET-CT – Concrete Technician – Level II
 - b. Reinforced Concrete Inspection

- 1) ACI-CCI Concrete Construction Inspector
- 2) ICC-RCSI Reinforced Concrete Special Inspector
- c. Structural Steel
 - 1) AWS-CWI Certified Welding Inspector
 - 2) AWS/AISC-CSI Certified Steel Inspector
 - 3) ICC-SWSI Structural Steel and Welding Inspector
- d. Non-Destructive Testing – American Society of Non-Destructive Testing
- e. Structural Masonry
 - 1) ICC-SMSI Structural Masonry Special Inspector

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION:

3.01 REPAIR AND PROTECTION:

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014100

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

EACH CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION OR FABRICATION OF A SYSTEM OR COMPONENT DESIGNATED IN THE QUALITY ASSURANCE PLAN MUST SUBMIT A STATEMENT OF RESPONSIBILITY.

PROJECT: CAMPUS FOR STUDENT SUCCESS – MULTIPURPOSE ROOM RENOVATION

CONTRACTOR'S NAME:

ADDRESS:

LICENSE NO.:

DESCRIPTION OF DESIGNATED BUILDING SYSTEMS AND COMPONENTS INCLUDED IN THE STATEMENT OF RESPONSIBILITY:

CONTRACTOR'S ACKNOWLEDGMENT OF SPECIAL REQUIREMENTS

I HEREBY ACKNOWLEDGE THAT I HAVE RECEIVED, READ, AND UNDERSTAND THE QUALITY ASSURANCE PLAN AND SPECIAL INSPECTION PROGRAM.

I HEREBY ACKNOWLEDGE THAT CONTROL WILL BE EXERCISED TO OBTAIN CONFORMANCE WITH THE CONSTRUCTION DOCUMENTS APPROVED BY THE BUILDING OFFICIAL.

SIGNATURE

DATE

CONTRACTOR'S PROVISIONS FOR QUALITY CONTROL

PROCEDURES FOR EXERCISING CONTROL WITHIN THE CONTRACTOR'S ORGANIZATION, THE METHOD AND FREQUENCY OF REPORTING AND THE DISTRIBUTION OF REPORTS IS ATTACHED TO THIS STATEMENT.

IDENTIFICATION AND QUALIFICATIONS OF THE PERSON(S) EXERCISING SUCH CONTROL AND THEIR POSITION(S) IN THE ORGANIZATION ARE ATTACHED TO THIS STATEMENT.

CASE FORM 103 ☐ **CONTRACTOR'S STATEMENT OF RESPONSIBILITY** ☐ **CASE 2004**

FABRICATOR'S CERTIFICATE OF COMPLIANCE

EACH APPROVED FABRICATOR THAT IS EXEMPT FROM SPECIAL INSPECTION OF SHOP FABRICATION AND IMPLEMENTATION PROCEDURES PER SECTION 1704.2 OF THE INTERNATIONAL BUILDING CODE MUST SUBMIT A FABRICATOR'S CERTIFICATE OF COMPLIANCE AT THE COMPLETION OF FABRICATION.

PROJECT: CAMPUS FOR STUDENT SUCCESS – MULTIPURPOSE ROOM RENOVATION

FABRICATOR'S NAME:

ADDRESS:

CERTIFICATION OR APPROVAL AGENCY:

CERTIFICATION NUMBER:

DATE OF LAST AUDIT OR APPROVAL:

DESCRIPTION OF STRUCTURAL MEMBERS AND ASSEMBLIES THAT HAVE BEEN FABRICATED:

I HEREBY CERTIFY THAT ITEMS DESCRIBED ABOVE WERE FABRICATED IN STRICT ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS.

SIGNATURE

DATE

TITLE

ATTACH COPIES OF FABRICATOR'S CERTIFICATION OR BUILDING CODE EVALUATION SERVICE REPORT AND FABRICATOR'S QUALITY CONTROL MANUAL

CASE FORM 104 ☐ **FABRICATOR'S CERTIFICATE OF COMPLIANCE** ☐ **CASE 2004**

END OF SECTION

Appendix A

HAMPTON ROADS AREA STATEMENT OF SPECIAL INSPECTIONS

PROJECT

NEWPORT NEWS CENTER FOR STUDENT SUCCESS RENOVATIONS

746 ADAMS DRIVE

NEWPORT NEWS, VA

PERMIT APPLICANT**PRIMARY RDP OF RECORD**

CHARLES TILLEY, AIA, REFP / QUINN EVANS

1840 WEST BROAD STREET, SUITE 400

RICHMOND, VA 23220

STRUCTURAL ENGINEER OF RECORD

JACQUELINE E. MILLER, PE / DUNBAR PLLC

1025 BOULDERS PARKWAY, SUITE 310

NORTH CHESTERFIELD, VIRGINIA 23225

BUILDING PERMIT NO: _____

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the International Building Code (IBC) as stated in the Virginia Uniform Statewide Building Code (USBC). It includes a Schedule of Special Inspections applicable to this project as well as the name of the Special Inspector and the identity of other testing laboratories or agencies intended to be retained for conducting these inspections or tests.

The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official, appropriate Registered Design Professional(s) (RDP(s)), Owner, and Contractor. All discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and appropriate RDP(s). Interim reports shall be submitted to the Building Official, Owner, Contractor, and the appropriate RDP(s) according to the *Hampton Roads Regional Special Inspection Guidelines and Procedures*.

Jobsite safety is solely the responsibility of the contractor. Materials and activities to be inspected are not to include the contractor's equipment and methods used to erect or install the materials listed. **All fees/costs related to the performance of Special Inspections shall be the responsibility of the Owner. Additionally, the undersigned (RDP or SER) are only acknowledging that the items enumerated on the Schedule of Special Inspections are consistent with the required design elements, the applicable sections of the Uniform Statewide Building Code, and their area of expertise.**

REVIEW, AUTHORIZATION & ACCEPTANCE:**Permit Applicant (General Contractor):**

Signature / date: _____

Printed Name: _____

Owner's Authorization:

Signature / date: _____

Printed Name: _____

Primary RDP of Record:(Review and Acceptance of Schedule)

Signature / date: _____

Printed Name: _____

Structural Engineer of Record:(Review and Acceptance of Schedule)

Signature / date: _____

Printed Name: JACQUELINE E. MILLER, PE

Building Official's Acceptance:

Signature / date: _____

Printed Name: _____

SCHEDULE OF SI PREPARED BY:

Virginia RDP Seal of SSI Preparer

JACQUELINE E. MILLER, PE

Printed Name of the Preparer of the Schedule (on line above)

Special Inspector:

Signature / date: _____

Printed Name: _____

SI Company Name: _____

SCHEDULE OF SPECIAL INSPECTIONS

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
GENERAL					
Pre-construction meeting	Meeting with parties listed in Section 9 of HRRSIGP to discuss Special Inspection procedures	Y	Scheduled by SI with the Contractor prior to commencement of work; VCC 113.4	1	
EARTHWORK					
Site preparation (structure)	Field testing and inspection	Y	Field Review; VCC 1705.6	2	
Fill material (structure)	Review submittals, field testing, and inspection	Y	Field Review; VCC 1705.6	2	
Fill compaction (structure)	In-place density tests, lift thickness	Y	Field Review; VCC 1705.6	2	
Excavation	Field inspection and verification of proper depth	Y	Field Review; VCC 1705.6	2	
Foundation subgrade (structure)	Field inspection of foundation subgrade prior to placement of concrete	Y	Field Review; VCC 1705.6	2	
DEEP FOUNDATION/HELICAL PILE FOUNDATION ELEMENTS					
Materials	Review product, sizes, and lengths	N	Submittal and Field Review; VCC 112.3, 1705.7, 1705.8, 1705.9, 1705.10		
Test piles	Monitor driving of test piles	N	Field Review; VCC 1705.7, 1705.8 or 1705.9		
Installation	Monitor drilling, placement, plumbness, driving of piles, including recording installation torque, pressure, blows per foot, cut off, and tip elevation	N	Field Review; VCC 1705.7, 1705.8, 1705.9		
Load test	Monitor pile load test	N	Field Review; VCC 1705.7, 1705.8 or 1705.9		
CONCRETE					
Materials	Review product supplied versus certificates of compliance and mix design	Y	Submittal & Field Review; ACI 318: Ch. 19, 26.4.3, 26.4.4; VCC 1705.3, 1903.2	2	
Installation of reinforcing steel, including welding, as well as prestress tendons, anchor bolts, and fiber-reinforcement	Field inspection of placement	Y	Submittal and Field Review; ACI 318: Ch. 20, 25.2, 25.3, 26.5.1-26.5.3; AWS D1.4; VCC 1705.3, 1705.3.1, 1705.3.2, 1901.3	2	
Formwork installation	Field inspection	N	Field Review; ACI 318; VCC 1705.3		
Concreting operations and placement	Field inspection of placement/sampling	Y	Field Review; ACI 318: 26.5.2, 26.12.3; ASTM C 172, C 31; VCC 1705.3	2	
Concrete curing	Field inspection of curing process	Y	Field Review; ACI 318: 26.5.3, 26.5.4, 26.5.5; VCC 1705.3	2	
Concrete strength	Evaluation of concrete strength	Y	Laboratory Testing; ACI 318: 26.12; VCC 1705.3	2	
Application of forces for prestressed concrete	Field inspection	N	Field Review; ACI 318: 26.10.2(e); VCC 1705.3		
Grouting of prestress tendons	Field inspection	N	Field Review; ACI 318: 19.4.1, 20.5.6, 26.13.3.2(b); VCC 1705.3		

Building Permit No: _____

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
PRECAST CONCRETE					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures**	N	Submittal or Field Review; VCC 1704.2.5, 1705.3		
Erection and installation	Review submittals and as-built assemblies; Field inspection of in-place precast	N	Submittal & Field Review; ACI 318; VCC Table 1705.3		
MASONRY (Level__2__ ; Building Risk Category __II__)					
Materials	Review of products supplied versus certificate of compliance and material submitted	Y	Submittal & Field Review; VCC 1705.4, 1709; TMS 402/602		
Strength	Testing/review of strength	Y	Submittal & Field Review; VCC 1705.4, 2105; TMS 402/602		
Mortar and Grout	Inspection of proportioning and mixing. Placement of mortar only	Y	Submittal & Field Review; VCC 1705.4; TMS 402/602		
Grout placement, including prestressing grout	Verification to ensure compliance	Y	Field Review; VCC 1705.4; TMS 402/602		
Grout space	Verification to ensure compliance	Y	Field Review; VCC 1705.4; TMS 402/602		
Mortar, grout, and prism specimens	Observe preparation	N	Field Review; VCC 1705.4; TMS 402/602		
Reinforcement, prestressing tendons, and connections	Inspect condition, size, location, and spacing	N	Field Review; VCC 1705.4; TMS 402/602		
Welding of reinforcing bars	Inspection and testing of welds	N	Field Review; VCC 1705.3.1, 1705.4; TMS 402/602		
Prestressing force	Verify application and measurement	N	Field Review; VCC 1705.4; TMS 402/602		
Protection	Inspect procedures for protection during cold and hot weather	N	Field Review; VCC 1705.4; TMS 402/602		
Anchorage	Inspection of anchorages	Y	Field Review; VCC 1705.4; TMS 402/602		
Masonry installation	Inspection of placement of masonry and joints	N	Field Review; VCC 1705.4; TMS 402/602		
STRUCTURAL STEEL					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures** or submit Certificate of Compliance	Y	Submittal or Field Review; VCC 113.5, 1704.2.5, 1704.2.5.1, 1705.2	1	
Bolts, nuts, and washers – materials	Material identification markings; Review of Certificate of Compliance	Y	Submittal & Field Review; VCC 1705.2.1; AISC 360 Section A3.3	2	
Bolts, nuts, washers – installation	Inspection of in-place high-strength bolts, snug-tight joints, pre-tensioned and bearing type, and slip critical connections	Y	Submittal & Field Review; VCC 1705.2.1, 2204.2; AISC 360 Section M2.5	2	
Structural steel – materials	Material identification markings and review of Certificate of Compliance	Y	Submittal & Field Review; VCC 1705.2.1; ASTM A6, A568; AISC 360 Section A3.1	2	
Structural steel details – installation	Inspection of member locations, structural details for bracing, connections, and stiffening	Y	Submittal & Field Review; VCC 1705.2.1; AISC 360	2	
Open-web steel joists and joist girders – installation	Inspection of end connections and bridging	N	Submittal & Field Review; VCC 1705.2.3; SJI-100		
Weld filler materials and welder certification	Review of identification markings, certificate of compliance, and welder certifications	Y	Submittal & Field Review; AISC 360 A3.5	2	

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
Welds	Inspection and testing of welds	Y	Field Review; VCC 1705.2, 2204.1; AWS D1.1, D1.3	2	
Cold-formed metal deck – materials	Review of identification marking manufacturer's certified test results	N	Submittal & Field Review; VCC 1705.2.2		
Cold-formed metal deck – installation	Review laps and welds	N	Submittal & Field Review; VCC 1705.2.2; AWS D1.3; SDI		
Cold-formed light frame construction – welds	Review welding operation	N	Field Review; VCC 1705.12.2, 1705.12.3		
Cold-formed light frame construction wind resistance – screws	Review screw attachment bolting, anchoring hold downs, bracing, diaphragms, struts		Field Review; VCC 1705.12.2, 1705.12.3		
Cold-formed steel trusses spanning 60' or greater	Inspection of temporary and permanent restraints/bracing	N	Submittal & Field Review; VCC 1705.2.4		
WOOD					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures** or submit Certificate of Compliance	N	Submittal or Field Review; VCC 113.5, 1704.2.5, 1704.2.5.1, 1705.5, 2303.4.7		
Metal plate connected wood/metal trusses spanning 60' or more	Review approved submittal and installation of restraint/bracing	N	Submittal & Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.5, 1705.5.2		
Joist hangers – materials/installation	Review manufacturer's material and test standards	N	Field Review; ASTM D 1761		
High-load diaphragms - installation	Review submittal and as-built assemblies; Inspection of sheathing, framing size, nail and staple diameter and length, number of fastener lines, and fastener spacing	N	Submittal & Field Review; VCC 1705.5, 1705.5.1		
Wood shear walls – installation	Review nailing, bolting, anchoring, fastening, diaphragms, struts, braces, and hold downs when fasteners are $\leq 4''$ on center	N	Field Review; VCC 1705.12.1		
Mass timber – anchorage	Review installation of anchorage to timber deep foundation	N	Field Review; VCC 1705.3, Table 1705.5.3		
Mass timber – erection	Inspection of member locations and structural details for bracing	N	Submittal & Field Review; VCC 1705.3, Table 1705.5.3		
Mass timber – threaded fasteners	Inspection of installation equipment, pre-drilled holes, and screws, including diameter, length, head type, spacing, installation angle, and depth	N	Submittal & Field Review; VCC 1705.3, Table 1705.5.3		
Mass timber – adhesive anchors	Installation of drilled hole depth and preparation; Review material and installation of adhesive anchors	N	Submittal & Field Review; VCC 1705.3, Table 1705.5.3		
Mass timber – bolted connections	Review materials and installation of bolts, nuts, and washers	N	Field Review; VCC 1705.3, Table 1705.5.3		
Mass timber – concealed connections	Review materials and installation of fasteners in all concealed locations	N	Field Review; VCC 1705.3, Table 1705.5.3		
MAIN WIND FORCE RESISTING SYSTEM					
Wind requirements	Review of the system components and installation for wood construction, cold-formed steel light frame construction, components, and cladding	N	Submittal & Field Review; VCC 1609.2, 1705.12		

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
SEISMIC FORCE RESISTING SYSTEMS					
Seismic requirements	Review of the designated seismic systems and seismic force resistance systems	N	Submittal & Field Review; VCC 1613, 1704.6, 1705.13, 1705.14; ASCE 7		
SMOKE CONTROL					
Special Inspection of smoke control systems	Leakage testing and recording of device location; Pressure difference testing, flow measurement and detection, and control verification	N	Field Review; VCC 1705.19, 1705.19.1, 1705.19.2		
SPRAYED FIRE RESISTIVE MATERIAL, FIRE RESISTANT PENETRATIONS; JOINTS, MASTIC AND INTUMESCENT FIRE RESISTANT COATING					
Structural member surface conditions	Field review of surface conditions prior to application	N	AWCI 12-B; VCC 1705.15, 1705.15.1, 1705.15.2		
Application/thickness/density/bond strength	Field review of application operations, thickness, and density	N	ASTM E605; AWCI 12-B; VCC 1705.15.1, 1705.15.2, 1705.15.3, 1705.15.4, 1705.15.5, 1705.15.6		
Mastic & intumescent fire resistant coating	Field review of application operations and thickness	N	AWCI 12-B; VCC 1705.16		
Mass timber sealant or adhesives	Field review of application of sealant or adhesives	N	ASTM C920, D3498; VCC 703.7, 1705.20		
EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)					
Application	Field Review of application/installation	N	ASTM E2570; VCC 1407.6, 1705.17		
SPECIAL CASES					
Retaining walls	Field review of installation of pre-manufactured structural components, drainage, and compaction	N	Field Review; VCC 113.4, 1705.1.1		
MEP Sprinkler system hangers/supports	Field review of placement and anchorage	N	Field Review; VCC 903.3.1.1, 1705.1.1; NFPA 13: 9.2		
Alternative materials and systems	As requested by Building Official, review system and installation	N	VCC 112.2, 112.3, 113.4, 1705.1.1		
INSPECTION AGENTS	FIRM	ADDRESS		TELEPHONE	
1. Special Inspector:					
2. Materials and Testing Laboratory:	NA				
3. Special Inspector Smoke Control System:	NA				
4. (Additional Agents)	NA				

Note: * The Qualifications of the Special Inspector and Testing Laboratories are subject to the Approval of the Building Official.

** Inspection of quality control procedures required only if fabricator is not regularly inspected by an Approved independent inspection agency or a referenced standard that provides requirements for quality control. [See Section 5.](#)

***For construction projects in seismic regions, the Schedule of Special Inspections shall be expanded to include Architectural, Mechanical, and Electric components, as well as Storage Racks and Isolation Systems. Items in VCC Section 1705.13

Building Permit No: _____

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Temporary construction and support facilities required may include but are not limited to:
 - 1. Temporary dust and weatherproofing partitions.
 - 2. Water service and distribution.
 - 3. Temporary electric power and lights.
 - 4. Temporary cooling and dehumidification.
 - 5. Storage facilities for construction materials, including security fencing.
 - 6. Sanitary facilities, including drinking water.
 - 7. Waste disposal services.
- C. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.03 USE CHARGES

- A. Power and water are available at the site but may require temporary shut off by the Contractor at the Contractor's expense. Additionally:
 - 1. The Contractor shall make local shut off to water supply at control valves and power at electrical panels as necessary.
 - 2. The Contractor shall make all necessary connections and distribution to serve the project.
 - 3. The Contractor shall remove any temporary distribution and connection at the conclusion of the work.
 - 4. The Contractor shall not be charged for any of the Owner's utility services used in course of the work at the school site.
 - 5. It should NOT be necessary to disconnect or shut off utility services to the entire building.

1.04 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 including items identified as Owner requirements and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate methods to be used to avoid trapping water in finished work.

- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.
- F. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
 - 1. Methods used to meet the goals and requirements of the Owner.
 - 2. Concrete cutting method(s) to be used.
 - 3. Location of construction devices on the site.
 - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
 - 6. Indicate locations of sensitive areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.05 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site. Remove asphalt mops from roof at the end of each working day.
- C. Coordinate deliveries of materials with the Owner and schedule deliveries or erection of major materials involving large trucks or cranes with the Owner to assist in availing the parking area in as needed. The Contractor is encouraged to schedule any such major deliveries or crane work that impedes traffic along neighborhood streets as little as possible, including bus traffic into and out of the school property.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete galvanized-steel bases for supporting posts.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
 - 1. Furnish and install 13 oz. vinyl windscreen signage as required - reference the Huntington Center specifications section 015000.
- C. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

- E. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material, and supply unit(s) with toilet tissue. Provide integral or separate hand-washing station(s). Use of the building's restroom facilities by contractor or subcontractor personnel is forbidden.

2.02 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.01 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.02 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities (if partially occupied new construction): Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.03 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary services.
 1. Arrange with Owner and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash 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. Use of Permanent Toilets: Use of Owner's existing / new toilet facilities is not permitted.
- C. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Install electric power service overhead unless otherwise indicated.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- F. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment for contractor and Owner's field office.
 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. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
- G. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner in Owner's field office.

3.04 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 2. Utilize designated area within existing building for temporary field offices.
 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Maintain temporary offsite parking areas for construction personnel.
- D. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. 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. Comply with work restrictions specified in Section 011000 "Summary."
- C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- D. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday. Remove all equipment from around the building at the end of each working day that would provide a means of access to the roof and lock up building at the end of each day.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- H. 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 - no smoking is allowed on the Site.
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. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.06 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- C. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.07 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than

Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 2. Section 01770 "Closeout Procedures" for submitting warranties.

1.03 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.04 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.05 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.

4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.07 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to 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. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other 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

2.01 BASIC PRODUCT REQUIREMENTS

- A. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:
 1. No available domestic product complies with the Contract Documents.
 2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.
- B. Where possible utilize materials harvested and manufactured regionally, within a 500-mile radius of the project site.

2.02 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. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 3. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
 4. 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. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

2.03 GENERAL ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS

- A. Avoidance of toxic materials: The Contractor will commit to not using the following toxic and hazardous materials:
1. Hazardous materials: Defined as pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA), the International Agency for Research on Cancer (IARC) or regulated under OSHA Hazard Communication Standard, 29 CFR 1910.1200.
 2. Harmful materials: Defined as materials which contain the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.
 3. Asbestos: No products containing asbestos.
 4. Lead:
 - a. Products containing lead content, including older or flux containing not more than 0.25 percent lead in wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures, and 0.20% for solder or flux used in plumbing for water intended for human consumption.
 - b. Not more than 100 ppm (by weight) added lead in all other building materials.

5. Mercury:
 - a. No new mercury containing thermometers, switches and electrical relays.
 - b. Lamps compliant with the low-mercury limits.
 6. Toxicity of prefabricated wood products (composite wood and agrifiber products):
Products shall contain no added urea-formaldehyde resins.
 - a. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.
 7. Sealants: Provide products that comply with specified VOC limits. Refer to Section 07 9200 – JOINT SEALANTS for additional requirements.
 - a. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.
 - b. Avoid the use of the following products: Butyl Rubber; Solvent Acrylic; Neoprene; Styrene Butadiene Rubber; Nitril.
- B. Toxic Material Reduction: The Contractor will commit to avoiding the use of following toxic materials:
1. Halogenated flame retardants: Limit to 100ppm in the following categories to the extent allowable by local code:
 - a. Window and waterproofing membranes, door and window frames and siding.
 - b. Flooring, ceiling tiles and wall coverings.
 - c. Piping and electrical cables, conduits and junction boxes.
 2. Phthalate (Plasticizers) Limitation: DEHP, DBP, BBP, DINP, DIDP or DNOP (often found in polyvinyl chloride PVC) are limited in the following components to 0.01% (100 ppm):
 - a. Flooring, including resilient and hard surface flooring and carpet.
 - b. Wall coverings, window blinds and shades, shower curtains, furniture and upholstery.
 - c. Plumbing pipes and moisture barriers.
 3. Isocyanate-Based Polyurethane Limitation: Isocyanate-based polyurethane products are not used in:
 - a. Interior finishes.
 4. Urea-Formaldehyde Restriction: Urea-formaldehyde presence is limited in the following components to 100 ppm:
 - a. Furniture or any composite wood products.
 - b. Laminating adhesives and resins.
 - c. Thermal insulation.

2.04 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."

2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 017300
EXECUTION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, and limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.02 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.03 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at Project site.
 - 1. Prior to establishing layout of new perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Professional surveyor or Contractor's personnel responsible for performing Project surveying and layout.
 - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.

3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.04 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 5. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. 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.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.05 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 PROGRESS CLEANING

- A. 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 debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- 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 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: 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 017419 "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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.07 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Pre-installation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.08 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 230500 "Heating, Ventilating and Air Conditioning."

- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.09 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturers' written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017329
CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes procedural requirements for cutting and patching in existing work.
- B. Refer to other sections for other requirements and limitations applicable to cutting and patching individual parts of the Work.
- C. Coordinate cutting and patching with demolition requirements as specified in section 017320 Selective Demolition.
- D. Coordinate with section 017419 Construction Waste Management & Disposal requirements specified herein Division 1.

1.03 DEFINITIONS

- A. Cutting and patching: Includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and repair required to restore surfaces to their original condition. Drilling holes for fasteners and similar operations are not "cutting and patching".

1.04 SUBMITTALS

- A. Cutting and Patching Plan: In accordance with section 013300, submit a proposal describing procedures at least 14 calendar days in advance of the time cutting and patching will initially be performed.
 - 1. Include the following information, as applicable:
 - a. Description of the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
 - b. Description of the anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in appearance and other significant visual elements.
 - c. List of products to be used and entities that will perform work.
 - d. Dates and hours of operation when cutting and patching will be performed.
 - e. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out-of-service temporarily. Indicate how long utility service will be disrupted.
 - f. Compatibility and cohesion characteristics of patching compounds with adjacent materials.
 - g. Details and engineering calculations showing integration of reinforcement with the original structure, where cutting and patching involve adding reinforcement to structural elements.
 - h. Temporary protection of existing structures, surfaces, finishes, equipment, etc. to remain in place during construction.
- B. Approval by Owner to proceed with cutting and patching does not waive the right to later require complete removal and replacement of unsatisfactory work.

1.05 QUALITY CONTROL

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 - 1. The cutting and patching plan shall include but not necessarily be limited to work required at the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.

- d. Structural steel.
 - e. Lintels.
 - f. Miscellaneous structural metals.
 - g. Equipment supports.
 - h. Piping, ductwork, vessels, and equipment.
 - i. Structural systems of other construction.
- B. Operational Limitations: Do not cut and patch operating elements, safety related systems, or related components in a manner that would result in reducing their capacity to perform as intended, or that would result in increased maintenance or decreased operational life or safety.
- 1. The cutting and patching plan shall include but not be limited to work required on the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - g. Control systems.
 - h. Communication systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of other construction.
 - l. Internet, data and telephone lines.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction that is cut and patched in a visually unsatisfactorily manner.
- 1. Retain the original installer or fabricator to cut and patch exposed work if the original installer or fabricator is identified in the Contract Documents or is known to the Contractor and is available for the work.
 - 2. If it is not possible to engage the original installer or fabricator, engage a Specialist who is specifically experienced in the work.
 - 3. The cutting and patching plan shall include but not be limited to work required at the following visual elements:
 - a. Preformed metal panels.
 - b. Fire-stopping.
 - c. Window wall system.
 - d. Acoustical ceilings.
 - e. Terrazzo.
 - f. Fluid-applied flooring.
 - g. Wall covering.
 - h. Mechanical system enclosures, cabinets, and covers.

1.06 EXISTING WARRANTIES

- A. Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any existing warranties.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use materials identical to existing materials to the maximum extent available.
- B. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

- C. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

- A. Before cutting, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
- B. Before proceeding with cutting and patching involving two or more trades, meet at the Project site with the entities providing or affected by the cutting and patching. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

- A. Provide temporary support of work to be cut.
- B. Protect existing conditions during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Bypass in-service existing pipe, conduit, or ductwork scheduled to be removed or relocated before cutting.
- E. 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.

3.03 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Cutting: Cut existing construction using methods least likely to damage elements retained and adjoining construction. Where possible, review proposed procedures with the original installer and comply with the original installer's recommendations.
 - 1. In general, use hand or small power tools designed for sawing or grinding, not for hammering and chopping.
 - 2. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 3. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 4. Cut through concrete and masonry using silicon carbide or harder tipped tools.
 - 5. Comply with requirements of applicable specification sections where cutting and patching requires excavating and backfilling.
 - 6. After utility services are bypassed, cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- B. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 1. Inspect and test patched areas to demonstrate integrity of the installation.
 - 2. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 3. Where removed walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 4. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface that contains the patch.

5. Patch, repair or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.04 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove all evidence of the Work.
- B. Thoroughly clean piping, conduit, and similar features before applying paint, restored pipe coverings, or other finishing materials.

END OF SECTION

**SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous construction waste.
 - 2. Disposing of nonhazardous construction waste.
- B. General: The Owner has identified recycling and minimizing of landfill-destined waste as a goal for this project. **This project is not designed to be LEED-certified**; however, the Owner requires the Contractor to recycle and minimize landfill waste to the greatest practical extent. The Owner wishes to demonstrate efficient recycling and waste reduction methods as an educational experience for the local community and the school system. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators.

1.03 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

1.05 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 14 days of date established for the Notice to Proceed.
 - 1. Analysis of estimated job-site waste to be generated, including types and quantities of compostable, recyclable and salvageable materials.
 - 2. Identification of recycling contractors and haulers proposed for use in the project and locations accepting construction waste materials or entities providing related services.
- B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present were recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

1.07 WASTE MANAGEMENT PLAN

- A. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use agreed upon form. Include estimated quantities and assumptions for estimates.
- B. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use an agreed upon form. Include points of waste

generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials , including the following:
 1. Construction Waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Gypsum board.
 - i. Piping.
 - j. Electrical conduit.
 - k. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.
 - l. Construction Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.

PART 3 EXECUTION

3.01 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 1. Provide bi-lingual signage.

- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.02 RECYCLING AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

3.03 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
- D. Paint: Seal containers and store by type.

3.04 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Burning: Do not burn waste materials.

END OF SECTION

**SECTION 017700
CLOSEOUT PROCEDURES**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Establishment of Substantial Completion
 - 2. Final acceptance
 - 3. Inspection procedures
 - 4. Project record document submittal
 - 5. Warranties.
 - 6. Final cleaning and repairs
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.03 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.
- B. SUBSTANTIAL COMPLETION: Notwithstanding any other definition of "Substantial Completion" in AIA A201, Substantial Completion shall be defined as the level of completion necessary for the Owner to occupy the renovated space and use it **fully** as intended. All required final inspections must be completed, and the local building official must have accepted all construction and issued its approval of all work.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.05 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.07 SUBSTANTIAL COMPLETION PROCEDURES

- A. It is the Contractor's responsibility to initiate procedures for obtaining a Certificate of Substantial Completion. This date of Substantial Completion must be before the expiration of the Contract

Time, or liquidated damages will be assessed. At Substantial Completion, all work must be complete with the exception of punch list items. Timely completion of the contract and obtaining the Building's Official approval of the final inspection is critical to the Owner's full use of this renovated area.

- B. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- C. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- D. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 - 6. Advise Owner of changeover in utility services.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements.
 - 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- E. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after

inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.08 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
 1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before the certificate will be issued.
 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C. Re-inspection Procedures: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance. If necessary, re-inspection will be repeated. If more than one inspection is needed following the issuing of the Certificate of Substantial Completion, an amount of \$1,000.00 will be deducted from the amount owed the Contractor for each subsequent inspection required of the Architect to verify that the Contractor's work is completed.

1.09 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: Architect will return annotated file.

- b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit on digital media acceptable to Architect .
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.
- E. 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.
- F. 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 benefitted from use of the Work through a portion of its anticipated useful service life.
- G. 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.
- H. The Owner reserves the right to refuse to accept 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 countersign such commitments are willing to do so.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.01 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning 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.
- C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site 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 not planted, mulched, or 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. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Systems and equipment maintenance manuals.
 - 3. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 017839 "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 3. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.03 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
- E. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.05 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Printed and Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file **AND** hard copies for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
 - 3. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

1.06 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Architect.
 - 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.07 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.08 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures,

maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly. Photographs are acceptable.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- I. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation. Photographs are acceptable.
 - 1. Do not use original project record documents as part of maintenance manuals.

1.09 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 48 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set of file prints.
 - 2) Submit Record Digital Data Files and one set of plots.
 - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned Record Prints and one set of file prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. ACBM Materials Statement: This project shall be free from all new asbestos containing building materials. The Contractor shall submit certification at the completion of the project with the Record Documents that no asbestos containing materials have been used in the construction.

1.04 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.05 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

1.06 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders , Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.03 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
 - 2. Prior to start of training, submit all completed Operations & Maintenance Manuals and two complete training manuals for Architect's review and Owner's use.
- B. Qualification Data: For facilitator.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.04 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.05 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.06 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
 - 5. Adjustments: Include the following:
 - a. Alignments.

- b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.07 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.08 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner , through Architect, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 018119
INDOOR AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.02 SUMMARY

- A. Provide Indoor Air Quality (IAQ) Management Plan to remain in force during the construction period.
- B. Comply with Chapter 3 of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 2nd Edition 2007, available from SMACNA (703-803-2980 or www.smacna.org).
- C. The Contractor shall develop, for Owner and Design Professional's review, an IAQ Management Plan for this Project.
- D. This specification addresses and requires the protection of the ventilation system components during construction and cleanup of contaminated components after construction is complete.

1.03 SUBMITTAL

- A. Construction Indoor Air Quality Management Plan (CIAQM Plan).

PART 2 - OBJECTIVES DURING CONSTRUCTION

2.01 PROTECTION

- A. Store all materials and equipment in a protected area (inside warehouse or storage trailer). Protect materials and equipment that are too large or heavy to store in a trailer from water and dirt/dust/debris.
 - 1. Large equipment and materials (pipe, conduit, brick, block, air-handling equipment, etc.) may be stored outside if two layers of 8 mil poly are placed on the ground and the equipment or material is then elevated to at least 4 inches to allow water to run off. The top and sides shall also be securely covered with two layers of 8 mil poly to prevent water penetration and dust/dirt accumulation.
- B. Protect HVAC equipment from dust and odors. Do not store equipment in areas near painting, pressure washing, or excavation. Do not operate equipment during cutting or grinding of masonry or concrete.
 - 1. Refer to Division 23 for construction filter requirements for protection of mechanical duct systems during construction.
 - 2. Clean ductwork when installed. Cap ends with poly during construction to prevent contamination.
 - 3. Do not operate HVAC system until the exterior walls, roof, glass, doors and building filters are properly installed.
 - 4. If air handlers must be used during construction, provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 at each air-handling unit. Provide specified prefilters and final filters for operation during construction or install temporary 4-inch MERV 8 filters at each return air grille for operation during construction.
 - 5. Replace all filtration media immediately prior to Substantial Completion.
 - a. Filtration media installed in air-handling units shall have a Minimum Efficiency Reporting Value (MERV) of 8.
 - 6. Do not perform Testing and Balancing until dust or odor generating activities are completed.

2.02 SOURCE CONTROL

- A. Minimize IAQ contaminants introduced by construction materials.

- B. Store waste construction materials a minimum of 30 feet away from the building.
- C. Do not smoke within 30 feet of the exterior building perimeter.

2.03 PATHWAY INTERRUPTION

- A. Provide barriers to contain construction areas to allow a portion of the building to be cleaned and then operate the HVAC system in that cleaned area. Acceptable barriers include dust curtains and temporary walls.
 - 1. Protect areas of the building in which HVAC is operational by physical barriers from areas of the building not acceptable for operation of the HVAC system.
- B. Maintain areas within 30 feet of outdoor air intakes free of dust, dirt, debris, and volatile materials while the HVAC system is in operation.

2.04 HOUSEKEEPING

- A. As dust accumulates at the Site, it can become airborne when disturbed by nearby activity. Similarly, spills or excess applications of products containing solvents will increase odors at the Site. Leaving the Site wet or damp for more than a day could result in the growth of mold and bacteria. Therefore, Site cleanup and maintenance is important to maintaining good IAQ during construction.
- B. Perform the following to control contaminants at the Site:
 - 1. Suppress dust with wetting agents or sweeping compounds
 - 2. Provide an efficient dust collection method (e.g. a damp rag, wet mop, or vacuum equipped with a high efficiency particulate arrester (HEPA) filter or wet scrubber).
 - 3. Remove spills or excess applications of solvent-containing products immediately. Provide low-VOC emitting spot removers and cleaning agents near occupied areas.
 - 4. Remove accumulated water and keep work areas as dry as possible, including the use of dehumidification, if necessary.
 - 5. Once building is enclosed, vacuum with HEPA filtered vacuum cleaners to prevent settled dust from becoming airborne again.
 - 6. Protect porous materials from exposure to moisture. Replace items that remain damp for more than four hours.

2.05 SCHEDULING

- A. Sequence construction to reduce absorption of VOCs by materials that act as sinks or contaminant sources. Complete application/installation of wet and odor-emitting materials before installing sink materials. Examples of types of these materials include, but are not limited to:
 - 1. Wet (Source) Materials:
 - a. composite wood products, millwork
 - b. adhesives, sealants and glazing compounds
 - c. wood preservatives, finishes, and paint
 - d. control or expansion joint fillers
 - e. all hard finishes requiring adhesive installation
 - f. gypsum board and associated finish processes
 - 2. Fuzzy (Sink) Materials:
 - a. carpet and padding
 - b. fabric wall-covering
 - c. insulation exposed to air stream
 - d. acoustic ceiling materials

PART 3 - NOT USED

END OF SECTION

SECTION 024119
SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Salvage of existing items to be reused or recycled.
- B. Extent of selective demolition work is indicated on drawings. The work under this Section applies thereto.
- C. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 017300 "Execution" for cutting and patching procedures.

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse .
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from the surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.04 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.

1.05 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Predemolition Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Submit before Work begins.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.07 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.08 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.09 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. All loose furnishings and equipment the Owner wishes to reuse.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
1. Hazardous material remediation is specified elsewhere in the Contract Documents.
- 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.

1.10 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. Notify warrantor before proceeding. Existing warranties include the following:
1. Existing Roofing system is under a manufacturer's warranty. Roof system was furnished and installed by Baker Roofing Company of Chesapeake, VA. Existing system is a fully-adhered, 60-ml thermoplastic polyolefin membrane by GAF Roofing.

- B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.
- B. Access to the work areas of this contract shall not include foot traffic across existing roof areas not in this Contract or completed portions of the roof.

PART 2 PRODUCTS

2.01 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

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of video. Provide the A/E and Owner prior to the release of the first request for payment.
 - 1. Inventory and record the condition of items to be removed and salvaged.
 - 2. Any items turned over to the owner shall be accompanied by a transmittal signed by the contractor and the owner (the individual receiving the item(s) for the owner shall sign the transmittal). Any items turned over without a transmittal shall be acknowledged as not being received.
 - 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 PREPARATION

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

3.03 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.

3.04 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.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- 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.
 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.05 SELECTIVE DEMOLITION, GENERAL

- 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. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. 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.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. 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.
5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- 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.

3.06 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- F. Existing Roofing: At roof areas where new roof top equipment is installed remove the existing roofing system as indicated on the drawings. Removal shall include, but not be limited to roof insulation, wood blocking, flashings (unless otherwise noted) at edge flashings, roof top equipment and roof accessories and all other items incorporated therein. The Contractor must repair, at his expense, any roof deck that he damages.

1. **Remove only as much roofing as can be replaced with a completely new roof system and made watertight in a single day.**
2. Clean all roof deck surfaces of loose material and other impediments that will be detrimental to application of the new materials.
3. Damaged deck shall be repaired before reroofing, in compliance with other requirements of these specifications.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

- 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."
 5. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
 - a. Existing lighting throughout many areas to be removed contains fluorescent tube lamps. These tubes shall be assumed to contain mercury vapor. Other lighting fixtures to be removed may be equipped with lamps containing halogens or other harmful compounds. All existing lighting fixture lamps shall be removed, handled and disposed of in a lawful manner preventing breakage and release of vapors on school property.
- B. Burning: Do not burn demolished materials.
- C. Recycling: The Contractor shall segregate all waste prior to disposal, and is encouraged to recycle demolished materials to the greatest practical extent.

3.08 CLEANING

- A. 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

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary.
- B. ACI MNL-66 - ACI Detailing Manual.
- C. ACI SPEC-301 - Specifications for Concrete Construction.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. CRSI (DA4) - Manual of Standard Practice.

1.04 PRE-INSTALLATION MEETINGS

- A. Meet at project site prior to beginning installation to review the following:
 - 1. Special inspector and testing/inspection agency procedures for field quality control.
 - 2. Steel-reinforcing installation.
 - 3. Construction contraction and isolation joints.

1.05 SUBMITTALS

- A. Shop Drawings: Comply with requirements of ACI MNL-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices. Indicate proposed construction joints required to build the structure.
- B. Reports: Submit certified copies of mill test report of reinforcement materials analysis.
- C. Product Data: Bar supports and rebar splicing/coupler systems.

1.06 SUBMITTAL PROCEDURES

- A. Submit shop drawings and product data in complete packages so that all parts of a given component or area may be reviewed together.
- B. Indicate the applicable Contract Drawings and Specification Sections used to develop the submittal.
- C. All modifications or revisions to submittals must be clearly clouded with a revision number and date indicated. Clouding of entire sheets, plans, sections, or details is not acceptable unless the sheet, plan, section, or detail is completely new to the revised submittal. The following may be considered cause for rejection of the submittal without review by the Engineer of Record.
 - 1. Failure to clearly indicate revisions with clouds and revision date.
 - 2. Submittal contains revisions or modifications to a previously reviewed submittal that were not requested by the Engineer of Record.
- D. Resubmittals: Make corrections and completely address all previous comments prior to resubmitting shop drawings and product data. The Engineer of Record will only review those sheets, plans, sections, and details that have been clouded and tagged with a revision triangle.

1.07 REQUESTS FOR INFORMATION (RFI) PROCEDURES

- A. RFIs shall be submitted by the Contractor. RFIs submitted by any other entity will not be reviewed.
- B. Limit RFIs to one main subject. RFIs including more than one main subject will be returned with a request to break them up into multiple RFIs.
- C. Submit RFIs only for clarification or interpretation of the Contract Documents. RFIs shall include a list of sheets, plans, sections, details, and specifications in the Contract Documents where the Contractor has already looked for the information being requested.
- D. RFIs requesting a substitution will be rejected. Any substitution requests shall follow Substitution Procedures indicated in Division 01 Specifications.
- E. RFIs submitted for correction of field work shall include the Contractor's proposed solution. Provide an engineered solution from the Contractor's engineer in applicable situations.

1.08 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Plain billet-steel bars.
 - 2. Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - 3. Joint Dowel Bars: ASTM A615, Grade 60, hot-dip galvanized steel bars as indicated, cut true to length with ends square and free of burrs.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 - 1. Review locations of splices with Architect.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- E. Comply with ACI 318 for concrete cover over reinforcement.

- F. Set wire ties with ends directed into concrete, not towards exposed concrete surfaces.
- G. Install weld-wire-fabric reinforcement in longest practical lengths.
 - 1. Continuous support spacing not to exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches.

3.02 FIELD QUALITY CONTROL

- A. The Owner will engage an independent special inspector and qualified inspection agency to perform field quality control tests and special inspections of the following:
 - 1. Inspect installed reinforcement and mechanical rebar-splicing/coupler devices for compliance with contract documents before concrete placement.
 - 2. Reinforcing bar welding
 - a. Verify weldability of reinforcing bars other than ASTM A706.
 - b. Inspect single-pass fillet welds, maximum 5/16".
 - c. Inspect all other welds.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Joint devices associated with concrete work.
- C. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 20 00 - Concrete Reinforcing.
- B. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

- A. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
- B. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary.
- C. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.
- D. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction.
- E. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- F. ACI PRC-305 - Guide to Hot Weather Concreting.
- G. ACI PRC-306 - Guide to Cold Weather Concreting.
- H. ACI PRC-308 - Guide to External Curing of Concrete.
- I. ACI PRC-347 - Guide to Formwork for Concrete.
- J. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials.
- K. ACI SPEC-301 - Specifications for Concrete Construction.
- L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- M. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- N. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- Q. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens).
- R. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- S. ASTM C150/C150M - Standard Specification for Portland Cement.
- T. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- V. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- W. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

- X. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.
- Y. ASTM C476 - Standard Specification for Grout for Masonry.
- Z. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- AA. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- BB. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- CC. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- DD. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.
- EE. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- FF. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- GG. ASTM C1708/C1708M - Standard Test Methods for Self-Leveling Mortars Containing Hydraulic Cements.
- HH. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types).
- II. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- JJ. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- KK. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
 - 2. For membrane-forming, moisture emission-reducing, curing and sealing compound, provide manufacturer's installation instructions.
- B. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate intended location within Project for each proposed mix design to include the the appropriate Exposure Class designation.
 - 2. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
 - 3. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
 - 4. Indicate proposed mix design complies with admixture manufacturer's written recommendations.
- C. Test Reports: Submit report for each test or series of tests specified.

1.05 SUBMITTAL PROCEDURES

- A. Submit shop drawings and product data in complete packages so that all parts of a given component or area may be reviewed together.

- B. Indicate the applicable Contract Drawings and Specification Sections used to develop the submittal.
- C. All modifications or revisions to submittals must be clearly clouded with a revision number and date indicated. Clouding of entire sheets, plans, sections, or details is not acceptable unless the sheet, plan, section, or detail is completely new to the revised submittal. The following may be considered cause for rejection of the submittal without review by the Engineer of Record.
 - 1. Failure to clearly indicate revisions with clouds and revision date.
 - 2. Submittal contains revisions or modifications to a previously reviewed submittal that were not requested by the Engineer of Record.
- D. Resubmittals: Make corrections and completely address all previous comments prior to resubmitting shop drawings and product data. The Engineer of Record will only review those sheets, plans, sections, and details that have been clouded and tagged with a revision triangle.

1.06 REQUESTS FOR INFORMATION (RFI) PROCEDURES

- A. RFIs shall be submitted by the Contractor. RFIs submitted by any other entity will not be reviewed.
- B. Limit RFIs to one main subject. RFIs including more than one main subject will be returned with a request to break them up into multiple RFIs.
- C. Submit RFIs only for clarification or interpretation of the Contract Documents. RFIs shall include a list of sheets, plans, sections, details, and specifications in the Contract Documents where the Contractor has already looked for the information being requested.
- D. RFIs requesting a substitution will be rejected. Any substitution requests shall follow Substitution Procedures indicated in Division 01 Specifications.
- E. RFIs submitted for correction of field work shall include the Contractor's proposed solution. Provide an engineered solution from the Contractor's engineer in applicable situations.

1.07 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal or Type II - Moderate. ASTM C150/C150M, Type III High-Early Strength may be used for cold weather construction.
 - 1. Acquire cement for entire project from same source.
- B. Blended Cement: ASTM C595/C595M, Type IL. Portland Limestone cement.
- C. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Alkali-Silica Reaction: For all concrete designated as Exposure Classification W1 and W2, requirements for the evaluation of the potential for alkali-aggregate reactivity must be mitigated in accordance with ASTM C1778. Perform aggregate testing in accordance with ASTM C1260 Accelerated Mortar Bar Test.
 - a. If test results indicate less than 0.10% expansion after 14 days immersion, the aggregate is considered to be innocuous and can be used with no further testing.
 - b. If test results indicate 0.10% or more expansion after 14 days immersion, the aggregate shall be further tested in accordance with ASTM C1293 Concrete Prism Test.

- 1) If test results indicate less than 0.04% expansion after one year, the aggregate is considered non-reactive and can be used with no further testing.
- 2) If test results indicate 0.04% or more expansion after one year, the aggregate is considered to be potentially deleteriously reactive and shall not be used unless Alkali Silica Reactive Preventative Measures are taken (ref. ASTM C1778 Sections 8 & 9).
3. Maximum Coarse Aggregate Size: 1 inch nominal, typical. Provide 3/8" maximum aggregate size for concrete toppings less than 3 inch thick.
4. Aggregate in Warehouse slabs and Polished Concrete slabs shall be a blended aggregate mix of three or more individual aggregate sizes in order to achieve a general uniform gradation from the 1 1/2" to the No. 100 sieve. Submit a combined aggregate sieve analysis of the fine and coarse aggregate indicating general uniform gradation and a maximum percentage on any given sieve of 24 percent. Material proportions shall provide a coarseness factor (CF) range of 60-75 percent, past fraction of 25-28 percent, and an adjusted workability factor $((11.25 - 0.15CF) + 35\%) \pm 2.5\%$. Comply with the recommendations of Section 8.5.4 of ACI 302.1R.
- D. Fly Ash: ASTM C618, Class F.
- E. Slag Cement: ASTM C989/C989M, proportion in accordance with ACI PRC-233.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- G. Synthetic Macro-Fiber Reinforcement: ASTM C1116/C1116M, Type III
 1. Fiber Length: 1 to 2 1/4 inches nominal.
 2. Fiber Type: Alkali-resistant synthetic.
 - a. Products:
 - 1) Euclid Chemical Company; TUF-STRAND SF: www.euclidchemical.com/#sle.
 - 2) Sika Fibermesh; Fibermesh 650: www.fibermesh.com/#sle.
 - 3) GCP Applied Technologies; STRUX 90/40: www.gcpat.com/#sle.
- H. Synthetic Fibrillated Micro-Fiber Reinforcement: ASTM C1116/C1116M, Type III.
 1. Fiber Length: 1/2 to 1 1/2 inches nominal.
 2. Fiber Type: Alkali-resistant synthetic
 - a. Products:
 - 1) Euclid Chemical Company; PSI Fiberstrand F: www.euclidchemical.com/#sle.
 - 2) Sika Fibermesh; Fibermesh 300: www.fibermesh.com/#sle.
 - 3) GCP Applied Technologies; Grace Microfiber: www.gcpat.com/#sle.

2.02 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement. Do not use calcium chloride or admixtures containing calcium chloride.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- F. Retarding Admixture: ASTM C494/C494M Type B.
- G. Water Reducing Admixture: ASTM C494/C494M Type A.

2.03 ACCESSORY MATERIALS

- A. Underslab Vapor Barrier:
 1. Sheet Material: ASTM E1745, Class A, not less than 15 mils thick; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.

2. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

2.04 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Semi-Rigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness range of 90 to 95 in accordance with ASTM D2240.

2.05 CURING MATERIALS

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
 1. Application: Use this product at all locations where Curing and Sealing Compounds are not required.
 2. Product dissipates within 4 to 6 weeks.
- B. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
 1. Application: Use at exposed interior slabs, including parking garage slabs.
 2. Vehicle: Water-based.
 3. Solids by Mass: 25 percent, minimum.
 4. VOC Content: OTC compliant.
- C. Moisture-Retaining Sheet: ASTM C171.
 1. Curing paper, regular.
 2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
 3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- D. Water: Potable, not detrimental to concrete.

2.06 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Concrete Mixes: Comply with the durability/exposure classification, weight, minimum strength, maximum water-cement ratio and air content requirements provided in the Structural Construction Documents.
 1. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - a. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
 2. Cement content: not less than indicated in ACI 301.
 3. Slump: The contractor's mix designer shall determine the appropriate slump for each type of concrete. Slump tolerances shall comply with ACI 117.
- C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
 1. Air Entrainment: All exterior exposed concrete shall include air-entrainment admixture.
- D. Macro-Fiber Reinforcement: Add to mix at rate of 4.0 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.
- E. Micro-Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

2.07 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Interior Slabs on Grade: Install vapor barrier under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor barrier before covering.
 - 1. Vapor Barrier Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.
- B. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor bond break material to prevent movement during concrete placement.
- C. Isolation Joints: Install wherever necessary to separate slab from other building members, including columns, wall, equipment foundations, footings, stairs, and other locations as indicated. Use polyethylene.
 - 1. Extend bond-breaking polyethylene strips full weight and depth of joint, terminating flush with finish concrete surface unless otherwise indicated on drawings.
 - 2. Terminate bond-breaking polyethylene strips not less than 1/2 in or more than 1 inch below finish concrete surface, where joint sealants are indicated.
 - 3. Install bond-breaking polyethylene strips in lengths as long as practicable.

- D. Saw Cut Contraction/Control Joints in Slabs-on-Ground: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; cut 1/8 in wide by at least 1 inch deep but not less than one quarter (1/4) the depth of the slab. Saw cutting joints should not tear, abrade, or otherwise damage surface and should begin before concrete develops random cracks.

3.06 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
- B. Place required dividers, edge strips, reinforcing, and other items to be cast in.
- C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

3.07 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Typical Slabs-on Ground: F(F) of 25; F(L) of 20.

3.08 CONCRETE FINISHING

- A. Concrete Floors and Slabs: Finish to requirements of ACI PRC-302.1, meeting ACI 117 tolerances and the Floor Flatness and Levelness tolerances specified. Unless indicated on Drawings, provide the following finishes:
 - 1. Scratch finish - for surfaces intended to receive bonded cementitious mixtures.
 - 2. Float finish - for walks, drives, steps, ramps and for surfaces intended to receive waterproofing, roofing, insulation, or sand-bed terrazzo.
 - 3. Trowel finish - for floors intended as walking surfaces, floors in manufacturing, storage, and warehousing areas, or floors that will receive floor coverings.
 - 4. Broom finish - for exterior concrete platforms, steps, ramps and locations indicated on Drawings. Coordinate final finish with Architect before application.

3.09 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 in with in-place construction.
 - 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 1. Comply with ACI PRC-305 for Hot Weather protection during curing.
 - a. Maintain moisture loss no more than 0.2 lb/sq. ft x h before and during finishing operations.
 - 2. Comply with ACI PRC-306 for Cold Weather protection during curing.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
 - 2. High early strength concrete: Not less than four days.
- C. Curing Methods
 - 1. Ponding, continuous fogging, or continuous sprinkling.
 - 2. Application of mats or fabric kept continuously wet.
 - 3. Continuous application of steam.
 - 4. Application of sheet materials conforming to ASTM C171.
 - 5. Application of curing compound conforming to ASTM C309 or ASTM C1315.

- a. The contractor shall be responsible for removing any traces of the dissipating curing compound ASTM C309 that remains on the concrete surface prior to application of adhesive-applied flooring or any type of bonded application.
 - b. Only use curing and sealing compound ASTM C1315 on surfaces where sealed concrete is the finished surface.
- D. Curing Formed Concrete Surfaces:
1. Keep absorbent wood forms wet until they are removed.
 2. As soon as forms can be loosened without damage to concrete, water should be applied to the top of the form and allowed to run down the interface between the form and new concrete until forms are fully removed.
 3. After form removal, formed surfaces, including underside of beams, supported slabs and other similar surfaces, should be cured for remainder of curing period by one of the listed methods.
- E. Curing Unformed Concrete Surfaces
1. After placement and finishing of concrete surfaces, apply one of the listed curing methods.

3.11 FIELD QUALITY CONTROL

- A. The owner will engage an independent special inspector and qualified testing agency to perform field quality control tests and special inspections of the following:
1. Inspect cast-in-place anchor installation, to included headed anchor rods and embed plates, for compliance with contract documents before concrete placement.
 2. Inspect post-installed anchor installation to verify conformance with manufacturer's installation instructions.
 3. Verify use of required design mix for placement location.
 4. Inspect, sample and test materials and concrete production. When it appears that material furnished or work performed fails to conform to Contract Documents, the testing agency will immediately report such deficiency to Architect/Engineer, Owner, Contractor and Concrete Supplier.
 5. Testing agency will report test and inspection results of the work to Owner, Architect/Engineer, Contractor and concrete supplier within 7 days after tests and inspections are performed. Strength test reports to include location in the Work where the concrete represented by each test was deposited, date and time sample was obtained, and batch ticket. Strength test reports to include detailed information of storage and curing of specimens before testing.
 6. Contractor to provide space and electrical power on the project site for facilities to be used for initial curing of concrete test specimens. Testing agency to be responsible for providing curing container for test specimens on site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 7. For each concrete mixture on the project placed in any one day, obtain samples of fresh concrete in accordance with ASTM C172, selected on a random basis.
 - a. Testing Frequency: Obtain one composite sample for each day's pour of each mixture exceeding 5 cu yd, but less than 25 cu yd, plus one set for each additional 50 cu yd or fraction thereof. 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.
 - b. Slump: ASTM C143/C143M: One test at truck (as delivered) for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - c. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for lightweight concrete: one test for each composite sample, but not less than one test for each day's pour of each concrete mixture
 - d. Concrete Temperature: ASTM C1064/C1064M: one test for each composite sample.

- e. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete: one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- f. Compression Test Specimens: ASTM C31/C31M: Samples shall be taken from concrete pump discharge hose when concrete is transported by concrete pump.
 - 1) Cast and laboratory cure one set of six 4-in by 8-in cylinder specimens for each composite sample. Cast additional cylinder specimens as required to satisfy OSHA requirements
- g. Compressive Strength Tests: ASTM C39/C39M: Test one set of two laboratory-cured specimens at 7 days and one set of three specimens at 28 days. Test one specimen at 56 days if required.
 - 1) Concrete strengths for acceptance shall be the average of at least three 4-in by 8-in cylinders tested at 28 days.
 - 2) Strength level of concrete mixture shall be acceptable if both are satisfied:
 - (a) Every average of any three consecutive strength tests equals or exceeds f'_c .
 - (b) No strength test falls below f'_c by more than 500 psi if f'_c is 5000 psi or less; or by more than $0.10 \times f'_c$ if f'_c exceeds 5000 psi.
- h. Nondestructive tests for uniformity: use of the rebound hammer in accordance with ASTM C805 or the pulse-velocity method in accordance with ASTM C597 may be permitted by Architect/Engineer to evaluate uniformity of in-place concrete or to select areas to be cored. These methods shall not be used to evaluate in-place strength.
- i. Testing agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strength, or other requirements have not been met, as directed by Architect.
- j. If concrete strength is in doubt or when required by Contract Documents, the testing agency shall obtain cores, prepared and tested in accordance with ASTM C42/C42M.
- k. Additional testing and inspecting required to demonstrate compliance with Contract Documents will be at the Contractor's expense.
- 8. Verify maintenance of specified curing temperatures and techniques.
- 9. Measure floor and slab flatness and levelness in accordance with ASTM E1155/E1155M within 72 hours of completion of floor finishing and before removal of supporting formwork or shoring (if applicable) and properly report test results to Architect. Report both composite overall values and local values for each measured section.
 - a. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than $F(F) 13 / F(L) 10$.
 - b. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- B. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.
- C. Repair Mortar: Mix dry-pack repair mortar, consisting of 1 part portland cement to 2 1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing. Alternatively, acceptable commercial repair products may be used for repairs - use in accordance with manufacturer's instructions.

- D. Partially Exposed Reinforcement: The surface of partially exposed reinforcement where exposed less than or equal to half the reinforcement bar size shall be clean of all detritus material. Where reinforcement is exposed more than half the reinforcement bar size, concrete shall be removed around the entire circumference of the reinforcement plus 3/4 inch and the reinforcement shall be clean of all detritus material.
- E. Repairing Formed Surfaces: Surface defects including color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projects on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, remove fins and cut out honeycombs, rock pockets, and voids that exceed ACI 301 Surface Finish requirements back to solid concrete.
 - a. Limit cut depth to 1/2 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact the patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on exposed concrete surfaces by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect/Engineer.
- F. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface. Test surfaces sloped to drain for trueness of slope and smoothness.
 - 1. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. Correct high areas by grinding, after concrete has cured at least 14 days. Depth of removal shall not exceed 1/4 inch without scanning the affected area to verify required concrete cover will be maintained.
 - 3. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with Self-Leveling Cementitious Concrete Floor Underlayment. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas that are scheduled to be left exposed with Architectural Concrete Floor Topping Overlayment. Feather edges to match adjacent floor elevations.
- G. Structural Repairs of Concrete: subject to Architect/Engineer's approval, using epoxy adhesives and patching mortar.

3.13 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.
- B. Maintain concrete protection to prevent freezing of the concrete and to ensure necessary strength development for structural safety.

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Brick.
 - 3. Mortar and grout materials.
 - 4. Ties and anchors.
 - 5. Embedded flashing.
 - 6. Accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Steel lintels in unit masonry.
 - 2. Steel shelf angles for supporting unit masonry.
- C. Related Requirements:
 - 1. Division 05 Section "Cold-Formed Metal Framing" for metal framed walls.
 - 2. Section 079200 - Joint Sealants: Sealing control and expansion joints.

1.02 DEFINITIONS

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

1.03 PREINSTALLATION MEETINGS

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

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
 - 1. Brick, in the form of straps of five or more bricks.
 - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 3. Cavity drainage material.
 - 4. Accessories embedded in masonry.

1.05 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Material Certificates: For each type of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.

- c. For exposed brick, include test report for efflorescence in accordance with ASTM C67/C67M.
 - d. For masonry units, include data and calculations establishing average net-area compressive strength of units.
- 2. Integral water repellent used in CMUs.
- 3. Cementitious materials. Include name of manufacturer, brand name, and type.
- 4. Mortar admixtures.
- 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
- 6. Grout mixes. Include description of type and proportions of ingredients.
- 7. Reinforcing bars.
- 8. Joint reinforcement.
- C. 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.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installers: All masonry flashing installers must complete the International Masonry Institute Flashing Upgrade training course.
 - 2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in the State of Virginia where Project is located and who is experienced in providing engineering services of the type indicated.
 - 3. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.
- B. Source quality control:
 - 1. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below.
 - a. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.
 - b. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry by testing masonry prisms in accordance with ASTM C1314.

2.02 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

2.03 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.
 2. Provide bullnose units for outside corners unless otherwise indicated.
 - a. Provide square edged units for outside corners at ceiling height unless otherwise indicated.
 3. Provide solid bullnose cap units at top of exposed free-standing walls as indicated on Drawings.
- B. Versalite is not considered to be non-conforming to ASTM C90.
- C. CMUs: ASTM C90, lightweight unless otherwise indicated.
 1. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.04 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.05 BRICK UNITS

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
- B. Clay Face Brick: Facing brick complying with ASTM C216 , Grade SW Grade MW or Grade SW, Type FBS .
 1. Color and Texture: Provide one of the following or substitute brick approved by Owner and Architect to match the existing exterior face brick.

2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi .
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M.
4. Efflorescence: Provide brick that has been tested in accordance with ASTM C67/C67M and is rated "not effloresced."
5. Size (Actual Dimensions):
 - a. Face Brick: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long ("Modular").
6. Application: Use where brick is exposed unless otherwise indicated.
7. General: Provide shapes indicated and as follows:
 - a. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - b. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintel.
 - c. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - d. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

2.06 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I. Provide natural color or white cement as required to produce mortar color indicated.
 1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
 1. Available Products:
 - a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
 - b. Davis Colors; True Tone Mortar Colors.
 - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- D. Preblended Dry Mortar Mix: Packaged blend made from masonry cement , sand, mortar pigments, and admixtures and complying with ASTM C91.
 1. Preblended Dry Masonry Cement Mortar Mix
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Capital Materials Corporation; Flamingo Color Masonry Cement.
 - 2) Essroc, Italcementi Group; Brixment-in-Color.
 - 3) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
 - 4) SPEC MIX, LLC.
- E. Aggregate for Mortar: ASTM C144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Aggregate for Grout: ASTM C404.

- G. Water: Clean and potable.

2.07 REINFORCEMENT AND ANCHORAGE

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- 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 steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 ft. , with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:
 - 1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
 - 2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
 - 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.08 TIES AND ANCHORS

- A. General: Ties and anchors extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Thermally Broken Stainless Steel: Type 304 or Type 316.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long for masonry constructed from solid units.
 - 2. Where wythes do not align , use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 - 3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel stainless steel wire.
- D. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.1084-inch- thick steel sheet, galvanized after fabrication .
 - 3. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 - 4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
 - 5. Masonry-Veneer Anchors; Structural thermally broken - Stainless Steel.

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) FERO Corporation.
 - 2) Pace Corporation

2.09 EMBEDDED FLASHING

- A. Flexible Flashing: Use one of the following unless otherwise indicated:
 1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 40 mil thick, with a 15-mil-thick coating of adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
 - 1) Color: Black.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 - 1) Stop Ends: Locate 'stop ends' at all window sills, headers, and inside corner terminations.
 - 2) Subflashing Support: Provide a continuous, 26 Ga., G90 galvanized angle, 3-inches x 6-inches for installation under flexible flashing.
- B. Drainage Plane Flashing: Fabricate from elastomeric membrane and drainage membrane to shapes indicated, including weep tabs, termination bar, and drip edge. Provide flashing materials as follows:
 1. Application: Unless otherwise indicated, use the following:
 - a. Where flashing is partly exposed and is indicated to terminate at the wall face, use flexible flashing with a stainless steel drip edge.
- C. Solder and Sealants for Sheet Metal Flashings:
 1. Elastomeric Sealant: ASTM C920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Termination Bars for Flexible Flashing, Flanged: Stainless steel sheet 0.019 inch by 1-1/2 inches with a 3/8-inch flange at top and bottom.
- F. Application: Unless otherwise indicated, use the following:
 1. Where flashing is partly exposed and is indicated to terminate at the wall face, use flexible flashing with a metal drip edge or flexible flashing with a metal sealant stop.
 2. Where flashing is fully concealed, use flexible flashing.

2.10 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by sealer manufacturer and manufacturer of masonry units being sealed.
 1. Available Manufacturers:
 - a. Diedrich Technologies, Inc.

- b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.; Stand Off SLX100 Water and Oil Repellant.
- D. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- E. Weep/Cavity Vents: Use the following unless otherwise indicated:
 - 1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) CavClear; a division of Archovations, Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) Keene Building Products.
 - 4) Mortar Net Solutions.
 - 2. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hohmann & Barnard, Inc.
 - 2) Williams Products, Inc.
 - 3) Wire-Bond.
- F. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Mortar Deflector: Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches that prevent clogging with mortar droppings.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) Keene Building Products.
 - 4) Mortar Net Solutions.
 - 5) Wire-Bond.

2.11 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. Use masonry cement mortar unless otherwise indicated.
 - 3. 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 or needed to provide required compressive strength of masonry.
- D. For masonry below grade or in contact with earth, use Type M.

1. For reinforced masonry, use Type S.
 2. For mortar parge coats, use Type S.
 3. For exterior, above-grade, load-bearing, 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.
- E. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments do not exceed 10 percent of portland cement by weight.
 2. Pigments do not exceed 5 percent of masonry cement by weight.
 3. Mix to match Architect's sample.
- F. 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 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 .
 3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. 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.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
1. 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, 1/4 inch in 20 feet, or 1/2 inch maximum.

2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. 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, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.03 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 (Norman size): Unless otherwise indicated, lay exposed masonry in one-third running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Bond Pattern for Exposed Masonry (modular size): Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistant Joint Systems."

3.04 MORTAR BEDDING AND JOINTING

- A. Lay CMUs and hollow brick 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.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units and hollow brick 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. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- D. Cut joints flush where indicated to receive waterproofing cavity wall insulation air barriers unless otherwise indicated.

3.05 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods :
 - 1. Individual Metal Ties: Provide ties as indicated installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use tab-type reinforcement.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
 - 3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not more than 8 inches clear horizontally and 16 inches clear vertically.
 - 4. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as indicated.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.06 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections connector sections and continuous wire in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.
- B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.07 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches 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.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.08 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 inch 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 o.c. vertically and 36 inches o.c. horizontally.
- B. REINFORCED UNIT MASONRY
 - 1. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 2. 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.
 - 3. 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.
 - 4. Placing Reinforcement: Comply with requirements in TMS 602.

5. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
6. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
7. Limit height of vertical grout pours to not more than 60 inches .

3.09 LINTELS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities and where indicated.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Control joints are indicated on the Drawings, generally for masonry veneer, column details, etc. Provide additional control joints in masonry not to exceed 30 feet horizontally. Joint locations shall be confirmed with the Architect prior to installation.
- D. Form expansion joints in brick as follows:
 1. Build in compressible joint fillers where indicated.
 2. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
 3. Expansion joints are indicated on the Drawings, generally for masonry veneer, column details, etc. Provide additional expansion joints in masonry where required. Expansion joint locations shall be confirmed with the Architect prior to installation.

3.11 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 or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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 ft., or 1/2-inch 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 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch 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 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

- C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. 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 will be at Contractor's expense.
- B. Testing Prior to Construction: One set of tests.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140/C140M for compressive strength.
- E. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.
- G. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members.
- B. Structural steel support members and struts.
- C. Base plates.
- D. Grouting under base plates.
- E. Shear stud connectors.
- F. Deformed bar anchors.

1.02 RELATED REQUIREMENTS

- A. Section 05 12 13 - Architecturally-Exposed Structural Steel Framing: Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).
- B. Section 05 21 00 - Steel Joist Framing.
- C. Section 05 31 00 - Steel Decking: Field installation of steel shear studs connectors through deck.
- D. Section 05 50 00 - Metal Fabrications: Bearing plates, loose lintels, shelf angles, raised-pattern floor plate, steel bar grating and other steel items not defined as structural steel.
- E. Section 07 81 00 - Applied Fire Protection: Fireproof protection to framing and metal deck systems.

1.03 DEFINITIONS

- A. Structural Steel - Structural frame members indicated on the Drawings and defined by AISC 303.
- B. Heavy Sections - Rolled or built-up sections meeting the following criteria:
 - 1. Column base plates more than 2 inches thick.
 - 2. Built-up members with plates more than 2 inches thick.
 - 3. Rolled shapes with flanges more than 1 1/2" inches thick.

1.04 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- H. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).
- I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
- K. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.

- L. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
- M. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- P. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.
- Q. SSPC-SP 3 - Power Tool Cleaning.

1.05 COORDINATION

- A. Coordinate selection of shop primers with subsequent paint topcoats to ensure compatibility. Comply with all manufacturer's written recommendations.
- B. Coordinate installation of anchor rods, bearing plates and other anchorage items embedded into other construction without delaying the work of other trades. Provide shop drawings with detailed layout information, setting diagrams, and installation instructions.

1.06 PRE-INSTALLATION MEETING

- A. Pre-installation conference - Hold conference on site with virtual attendance option.

1.07 SUBMITTALS

- A. Product Data and Product Test Reports
 - 1. Structural steel materials.
 - 2. Bolt-nut-washer assemblies.
 - 3. Shear stud connectors.
 - 4. Deformed bar anchors.
 - 5. Anchor rods.
 - 6. Shrinkage-resistant grout.
 - 7. Shop primer.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 5. Indicate bolt type, size, and length. Include requirements for pre-tensioned and slip-critical connections.
 - 6. Include items embedded in other construction.
 - 7. Identify surface preparation and shop primer.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports:
 - 1. Charpy V-Notch Test Results
 - a. Heavy Sections with complete-joint-penetration welds.
 - b. Weld filler material used in complete-joint-penetration welds of Heavy Sections.
- E. Fabricator Test Reports: Comply with ASTM A1011/A1011M.
- F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M.

- G. Connection Designer's Qualification Statement.
- H. Fabricator's Qualification Statement.
- I. Erector's Qualification Statement.
- J. Paint Compatibility Certificates: From topcoat manufacturers certifying that topcoats are compatible with shop primers.
- K. Source Quality Control Reports: Including ultrasonic testing of complete-joint-penetration welds performed at the fabricator's shop.
- L. Certificate of Compliance: The approved fabricator shall submit a certificate of compliance to the AHJ stating that the materials supplied and work performed by the fabricator are in accordance with the Construction Documents.
- M. Field Quality Control Reports.

1.08 SUBMITTAL PROCEDURES

- A. Submit shop drawings and product data in complete packages so that all parts of a given component or area may be reviewed together.
- B. Indicate the applicable Contract Drawings and Specification Sections used to develop the submittal.
- C. All modifications or revisions to submittals must be clearly clouded with a revision number and date indicated. Clouding of entire sheets, plans, sections, or details is not acceptable unless the sheet, plan, section, or detail is completely new to the revised submittal. The following may be considered cause for rejection of the submittal without review by the Engineer of Record.
 - 1. Failure to clearly indicate revisions with clouds and revision date.
 - 2. Submittal contains revisions or modifications to a previously reviewed submittal that were not requested by the Engineer of Record.
- D. Resubmittals: Make corrections and completely address all previous comments prior to resubmitting shop drawings and product data. The Engineer of Record will only review those sheets, plans, sections, and details that have been clouded and tagged with a revision triangle.

1.09 REQUESTS FOR INFORMATION (RFI) PROCEDURES

- A. RFIs shall be submitted by the Contractor. RFIs submitted by any other entity will not be reviewed.
- B. Limit RFIs to one main subject. RFIs including more than one main subject will be returned with a request to break them up into multiple RFIs.
- C. Submit RFIs only for clarification or interpretation of the Contract Documents. RFIs shall include a list of sheets, plans, sections, details, and specifications in the Contract Documents where the Contractor has already looked for the information being requested.
- D. RFIs requesting a substitution will be rejected. Any substitution requests shall follow Substitution Procedures indicated in Division 01 Specifications.
- E. RFIs submitted for correction of field work shall include the Contractor's proposed solution. Provide an engineered solution from the Contractor's engineer in applicable situations.

1.10 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Structural steel members designated as architecturally-exposed structural steel (AESS) to also comply with Section 05 12 13.
- C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M.

- D. Fabricator Qualifications: Fabricator shall participate in a Quality Certification Program audited by an independent third party. Use one of the two following compliance paths.
 - 1. AISC-Certified Plant, Category BU
 - 2. Independent inspection and quality control agency: Fabricator shall employ a qualified independent testing and inspection agency to conduct periodic in-plant inspections of the fabricator's plant. Inspections shall be at a frequency required to assure the fabricator's conformance with the requirements of the inspection agency's approved quality assurance program as required by the Building Code.
- E. Erector Qualifications: Installer shall participate in a Quality Certification Program audited by an independent third party. Use one of the two following compliance paths.
 - 1. AISC Certified Erector, Category CSE
 - 2. Independent inspection and quality control agency: Erector shall employ a qualified independent testing and inspection agency to conduct periodic field inspections of the erector's work. Inspections shall be at a frequency required to assure the erector's conformance with the requirements of the inspection agency's approved quality assurance program as required by the Building Code.
- F. Fabricator and Erector Quality Certification Programs shall adhere to the minimum requirements of AISC 360, Chapter N.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store steel members off the ground using supports and spacers. Protect steel members from corrosion.
- B. Store fasteners in sealed containers with visible manufacturer's identifying label.
 - 1. Clean and re-lubricate snug-tightened bolts that become dry or rusty.
 - 2. Clean and re-lubricate tension-control bolts that become dry or rusty in conformance with written manufacturer's instructions. Re-test bolt assemblies after cleaning and relubrication per manufacturer's instructions.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Comply with the following standards and specifications:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specifications for Structural Joints Using High-Strength Bolts".
- B. Connection Design:
 - 1. AISC Option 1: Connection designs have been completed and required connections are indicated on the Drawings.

2.02 MATERIALS

- A. Steel W-Shapes, Channels and WT-Shapes: ASTM A992/A992M.
- B. Steel Angles, S-Shapes, Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.
- C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
- D. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
 - 1. Finish: Plain
 - 2. Finish: Hot-dip zinc coating where indicated to be galvanized on Drawings.
- E. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.
 - 1. Finish: Plain.
 - 2. Finish: Hot-dip zinc coating where indicated to be galvanized on Drawings.

- F. Extra-Thick Washers: Provide Extra-Thick (5/16") ASTM F436 washers at all connections with oversized or short-slotted holes in the outer ply of the connection with bolts larger than 1 inch diameter.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 - 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
- I. Shop and Touch-Up Primer: Fabricator's standard lead-free and chromate-free, rust-inhibiting primer compatible with topcoat. Primer shall comply with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Shop fabricate structural steel to greatest extent possible in accordance with AISC 303 and AISC 360.
 - 1. Develop required camber for members.
 - 2. Fabricate steel beams and girders with mill rolling camber pointing upwards.
 - 3. Mark and match-mark materials for field erection.
- B. Thermal Cutting: Use machines to greatest extent possible. Plane thermally cut edges to be welded per requirements of AWS D1.1.
- C. Mill Finishing: Provide at ends of columns and other members transmitting bearing forces.
- D. Bolt Holes: Punch, drill, or mechanically thermally cut holes. Where field access for nut tightening is limited, tack weld nuts to members to receive field bolt.
- E. Bolted Connections: Shop connections using high-strength bolts shall adhere to RCSC's "Specification for Structural Joints Using High-Strength Bolts".
- F. Welded Connections: Shop welded connections shall adhere to AWS D1.1 and AWS D1.8 and maintain tolerances is AISC 303 for mill material.

2.04 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 3.

2.05 SOURCE QUALITY CONTROL

- A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
- B. Welded Connections: Visually inspect all shop-welded connections and test complete-joint-penetration welds using the following:
 - 1. Ultrasonic testing performed in accordance with ASTM E164.
 - 2. Test 10% of CJP welds in Risk Category II structures. Test 100% of CJP welds in Risk Category III and IV structures.
 - 3. Reductions and increases in the rate of ultrasonic testing shall be in accordance with Paragraphs N5.5e and N5.5f of AISC 360.
 - 4. Prepare submittal of testing and inspection reports.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.

- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Column Baseplates and Beam/Joist Bearing Plates
 - 1. Clean concrete and masonry surfaces to receive base plates or bearing plates.
 - 2. Use steel shims, leveling nuts, or leveling plates to establish correct bearing elevation.
 - 3. Snug-tighten anchor rods only after framing area has been positioned and made plumb.
 - 4. Grout solidly between base plates/bearing plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.
- D. Align and adjust structural steel members to comply with tolerances in AISC 303 prior to permanently connecting to supporting members. Take into account the effect of temperature differences in the structural steel between the time of erection and building completion.
- E. Field weld components indicated on drawings and in compliance with AWS D1.1.
 - 1. Remove paint or galvanizing adjacent to field welds in accordance with AISC 303 and AISC 360.
 - 2. Remove backing bars and runoff tabs as required for ultrasonic testing of complete-joint-penetration welds.
 - 3. Weld assemblies in such a manner that maintains mil material tolerances in AISC 303.
- F. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
 - 1. Ream holes that must be enlarged for bolted connections. Do not enlarge holes by other means.
 - 2. Snug-tighten bolts unless noted otherwise. Tension-control bolts are allowed to be used in all connections if preferred by the erector.
 - 3. Use Extra Thick (5/16") ASTM F436 washers at all connections with oversized or short-slotted holes in outer ply of the connections with bolts larger than 1 inch diameter. Use standard ASTM F436 washers otherwise.
- G. Deformed Bar Anchors and Headed Shear Connectors: Prepare steel surfaces as recommended by manufacturer of deformed bar anchors and headed shear connectors. Use automatic end welding of deformed bar anchors and headed shear connectors in accordance with AWS D1.1 and manufacturer's instructions.
- H. Do not field cut or alter structural members without approval of Architect.

3.03 FIELD QUALITY CONTROL

- A. The Owner's Special Inspector and independent testing agency shall perform field quality control tests and special inspections.
 - 1. Structural steel material verification and inspection of structural steel joints.
 - 2. Weld material verification and inspection of welds.
 - 3. Bolt and connection material verification and inspection of bolted connections.
 - 4. All testing and inspections of Structural Steel Framing and Architecturally Exposed Structural Steel Framing shall be done in conformance with Chapter 17 of the Construction Code and AISC Chapter N.
- B. High-Strength Bolts: The Owner's Special Inspector and independent testing agency shall provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
- C. Welded Connections: The Owner's Special Inspector and independent testing agency shall visually inspect all field-welded connections and test complete-joint-penetration welds using the following:
 - 1. Ultrasonic testing performed in accordance with ASTM E164.

2. Test 10% of CJP welds in Risk Category II structures. Test 100% of CJP welds in Risk Category III and IV structures.
3. Reductions and increases in the rate of ultrasonic testing shall be in accordance with Paragraphs N5.5e and N5.5f of AISC 360.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous framing and supports.
 - 2. Steel angle frames around roof openings.
 - 3. Shelf angles.
 - 4. Miscellaneous lintels at ductwork openings.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.03 RELATED REQUIREMENTS

- A. Section 042000 - Unit Masonry: For installing loose lintels, anchor bolts, and other items built into unit masonry.
- B. Section 051200 - Structural Steel Framing: for steel framing, supports, divider beams, door frames, and other steel items attached to the structural-steel framing.
- C. Section 079200 – Joint Sealants: for sealants to be used at all penetrations of metal fabrications through existing or new exterior wall construction.

1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with the paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.05 ACTION SUBMITTALS

- A. Product Data:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Fasteners.
 - 3. Shop primers.
 - 4. Manufactured metal ladders.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Shelf angles.

1.06 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.01 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.02 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

2.03 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.04 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.06 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

- C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.07 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.08 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.09 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. 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.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. 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.

PART 3 EXECUTION

4.01 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 1. Extruded Aluminum: Two coats of clear lacquer.

4.02 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to, and rigidly brace from, building structure.
- C. Anchor shelf angles securely to existing construction with expansion anchors anchor bolts through bolts.

4.03 INSTALLATION OF SHELF ANGLES

- A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

4.04 REPAIRS

- A. Touchup Painting:
 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

**SECTION 061000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes:
 - 1. Wood blocking, cants, and nailers.
 - 2. Plywood backing panels.
 - 3. Fire-retardant concealed wood blocking used for backing inside of walls, above ceilings and other locations where needed for anchorage of various items, mounting brackets for devices, and similar features.
 - 4. Miscellaneous wood nailers, furring, and grounds.

1.03 RELATED REQUIREMENTS

- A. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
- B. Section 064023 "Interior Architectural Woodwork" for nonstructural carpentry items exposed to view and not specified in another Section.

1.04 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Lumber grading agencies, and abbreviations used to reference them, include the following:
- D. NeLMA: Northeastern Lumber Manufacturers' Association.
- E. NLGA: National Lumber Grades Authority.
- F. SPIB: The Southern Pine Inspection Bureau.
- G. WCLIB: West Coast Lumber Inspection Bureau.
- H. WWPA: Western Wood Products Association.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.06 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.
- C. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.

PART 2 PRODUCTS

2.01 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, mark grade stamp on end or back of each piece .
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
 - 4. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber:
 - 1. Boards: 15 percent.
 - 2. Dimension Lumber: 15 percent unless otherwise indicated.

2.02 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 - 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 - 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.03 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C , in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.04 FASTENERS

- A. General: Fasteners are to be of size and type indicated and 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 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 ASTM F2329 or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. 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.

2.05 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
 - 3. After treatment, redry dimension lumber to 19 percent maximum moisture content.
- 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.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece .
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawl spaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.06 FIRE-RETARDANT TREATED MATERIALS

- A. General: Comply with performance requirements in AWP A C20 (lumber) and AWP A C27 (plywood).
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Use Exterior type for exterior locations and where indicated.
 - 3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 - 4. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

- C. Application: Treat ALL concealed wood blocking for use at interior locations.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
- L. ICC-ES evaluation report for fastener.
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
- M. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.02 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 064023
INTERIOR ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Standing and Running Trim.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips.

1.03 ACTION SUBMITTALS

- A. Product Data:
 - 1. Standing and Running Trim.
 - 2. Miscellaneous materials.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show large-scale details.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- C. Samples for Initial Selection: For each type of exposed finish.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

1.05 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
 - 1. Low-Emitting Materials: Adhesives, sealants, composite woods, agrifiber products and laminating adhesives installed within the building waterproofing envelope shall comply with product requirements in accordance with Division 01 Section "Indoor Air Quality Requirements."

2.02 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural millwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
 - 2. Wood Species and Cut for Transparent Finish: White Hard Maple, plain sliced.

2.03 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face

of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.04 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom -grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate architectural standing and running trim to dimensions, profiles, and details indicated.
- D. 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.
- E. 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.

2.05 SHOP FINISHING

- A. General: Finish trim at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 - 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling. Concealed surfaces of plastic-laminate-clad paneling do not require backpriming when surfaced with plastic laminate.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. AWI Finish System: Conversion varnish.
 - 3. Staining: Match approved sample for color.
 - a. Custom stain required to match wood doors.
 - 4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 EXECUTION

3.01 PREPARATION

- A. Before installation, condition woodwork to humidity conditions in installation areas for not less than 72 hours.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 INSTALLATION

- A. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- B. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- C. Standing and Running Trim
 - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
 - 2. Do not use pieces less than 96 inches (2400 mm) long, except where shorter single-length pieces are necessary.
 - 3. Scarf running joints and stagger in adjacent and related members.
 - 4. Fill gaps, if any, between top of base and wall with plastic wood filler; sand smooth.
 - 5. Anchor to supporting substrate.
 - 6. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- D. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 075400
PATCHING AND REPAIR OF THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

A. RELATED DOCUMENTS

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

1.1 SUMMARY

- A. This Section shall apply to roofing work at existing low-slope roofing where indicated on the Drawings. Patching and repairs are required in conjunction with installation of new HVAC system components, equipment, structural supports, curbs, and related accessories. Existing low-slope, fully adhered thermoplastic polyolefin roofing system by GAF was installed by Baker Roofing of Chesapeake, VA and is under warranty. All work shall be performed to maintain the existing warranty.
- B. Section Includes:
1. Self-adhering, thermoplastic polyolefin (TPO) single-ply roofing system.
 2. Accessory roofing materials.
 3. Vapor retarder.
 4. Roof insulation.
 5. Insulation accessories and cover board.
 6. Incorporation of sheet metal flashing components and roofing accessories into the roof system.
- C. Related Requirements:
1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
 2. Section 076200 - Sheet Metal Flashing and Trim for metal roof flashings and counterflashings. Materials specified in this section for roofing application shall form part of the Total System Warranty of the roof manufacturer/installer.
 3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
- D. Description of Work:
1. The basic work descriptions (components, layering and attachment methods) required in this specification are referenced below. See also Parts 2 and 3 for specific products, preparation, application and details.
 - a. Project Type: Roof Patching and repairs.
 - b. Deck: Poured Gypsum on Insulating Form Board.
 - c. Insulation: Minimum 2 layers of Polyisocyanurate: Mechanically attach first layer of insulation; secure subsequent layers of insulation and cover board with cold-applied adhesive in a thickness to match adjacent top of membrane.
 - d. Cover Board: ASTM C 1177/C 1177M, glass-mat, 100% inorganic, water-resistant gypsum substrate, 5/8-inch (16 mm) thick glass Mat Roof Board.
 - e. Roof System : GAF EverGuard, 60-mil, fully adhered. Contractor to verify.
 - f. Specified Guarantee: Twenty Year Roof Membrane flashings, gravel stop and fascia, "Full System Warranty" Guarantee with an insulation inclusion addendum.
 - g. Approved Manufacturers: The following manufacturer is approved to bid based upon an existing 20 year warranty:
 - 1) GAF – Certified GAF Roof Contractor.

1.2 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review requirements for tear-off of existing membrane roofing and phasing requirements of project.
 - 7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 - 8. Review governing regulations and requirements for insurance and certificates if applicable.
 - 9. Review temporary protection requirements for roofing system during and after installation.
 - 10. Review roof observation and repair procedures after roofing installation.
 - 11. Record discussion, including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant within 7 days following the meeting. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
 - 12. Notification: Give a minimum of five (5) days' notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
 - 13. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. Thermoplastic polyolefin (TPO) roofing system.
 - 2. Accessory roofing materials.
 - 3. Vapor retarder.
 - 4. Roof insulation.
 - 5. Insulation accessories and cover board.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 - 1. Layout and thickness of insulation.
 - 2. Base flashings and membrane termination details.
 - 3. Flashing details at penetrations.
 - 4. Tapered insulation layout, thickness, and slopes.

5. Roof plan showing orientation of roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings, of color required.
2. Walkway pads or rolls, of color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Project Acceptance: Submit a completed manufacturer's application for roof guarantee form along with shop drawings of the roofs showing all dimensions, penetrations, and details. The form shall contain all the technical information applicable to the project including deck types, roof slopes, base sheet and/or insulation assemblies (with method of attachment, and fastener type), and manufacturer's membrane assembly proposed for installation. The form shall also contain accurate and complete information requested including proper names, addresses, zip codes and telephone numbers. The project must receive approval, through this process, prior to shipment of materials to the project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

1.10 WARRANTY

- A. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Contractor's guarantees - Roofing Installer shall guarantee materials and workmanship of the finished installation to the full extent as that of the manufacturer's guarantee as outlined in this "Guarantee/Warranty" article. The existing roof warrantor, GAF, Inc., will observe and approve all roof membrane and substrate work under this contract that comes into contact with previously-installed, low-slope TPO roofing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings to remain watertight.

1. Accelerated Weathering: Roof to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 2. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, self-adhering TPO sheet.
1. Basis-of-Design Product: Subject to compliance with requirements, provide GAF EverGuard system.
 2. Thickness: 60 mils , nominal.
 3. Exposed Face Color: White .

2.3 ACCESSORY ROOFING MATERIALS

- A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
 2. Verify adhesives and sealants comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. Sealant Primers for Porous Substrates: 775 g/L.
 - g. Sealant Primers for Nonporous Substrates: 250 g/L.
 - h. Nonmembrane Roof Sealants: 300 g/L.
 - i. Single-Ply Roof Membrane Sealants: 450 g/L.
 - j. Other Adhesives: 250 g/L.
 - k. PVC Welding Compounds: 510 g/L.
 3. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Bonding Adhesive: Manufacturer's standard.

- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 VAPOR RETARDER

- A. Polyethylene Film: ASTM D4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm .
 - 1. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
 - 2. Adhesive: Manufacturer's standard lap adhesive, listed by FM Approvals for vapor retarder application.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2 , felt or glass-fiber mat facer on both major surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GAF.
 - b. Carlisle Syntec Systems.
 - c. Certaineed; SAINT-GOBAIN.
 - d. Firestone Building Products.
 - 2. Compressive Strength: 20 psi .
 - 3. Size: 48 by 48 inches .
 - 4. Thickness:
 - a. Base Layer: 1-1/2 inches .
 - b. Upper Layer: As indicated in the drawings .
- C. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation .
 - 2. Minimum Thickness: 1/4 inch.
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES AND COVER BOARD

- A. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Verify adhesives and sealants comply with the following limits for VOC content:

- a. Plastic Foam Adhesives: 50 g/L.
- b. Gypsum Board and Panel Adhesives: 50 g/L.
- c. Multipurpose Construction Adhesives: 70 g/L.
- d. Fiberglass Adhesives: 80 g/L.
- e. Contact Adhesives: 80 g/L.
- f. PVC Welding Compounds: 510 g/L.
- g. Other Adhesives: 250 g/L.
- h. Sealant Primers for Porous Substrates: 775 g/L.
- i. Sealant Primers for Nonporous Substrates: 250 g/L.
- j. Nonmembrane Roof Sealants: 300 g/L.
- k. Single-Ply Roof Membrane Sealants: 450 g/L.
2. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide roof for limited removal of roof membrane and substrate in accordance with the drawings and requirements of Section 024119, "Selective Demolition." Coordinate removal of roofing membrane and substrate carefully with provision and layout of new rooftop-mounted mechanical equipment. Identify all existing roof structural members below prior to locating and laying out roof penetrations.
- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 1. Submit test result within 24 hours after performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches, respectively.
 - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
 - 2. Continuously seal side and end laps with tape .
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.
 - a. Locate end joints over crests of decking.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification .
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
 - 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.

- b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
- c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
- e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
- f. Fill gaps exceeding 1/4 inch with insulation.
- g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- h. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075400

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Fabricated sheet metal items, including flashings, counterflashings, exterior penetrations, and other items indicated in the Drawings.
- B. Related Sections:
 - 1. Division 07 Section "Patching and Repair of Modified Bituminous Membrane Roofing" for installing sheet metal flashing and trim integral with membrane roofing.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties, and in select areas as indicated by the Architect.
 - 1. Include plans, elevations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 - 2. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 3. Detail termination points and assemblies, including fixed points.
 - 4. Include details of special conditions.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated 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. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that 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.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings/
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 PRODUCTS

2.01 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: Smooth, flat.
 - 2. Gauge: 20 GA minimum.
 - 3. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 4. Color: Match Architect's samples.
 - 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 a minimum total dry film thickness of 0.5 mil.

2.02 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and 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.
 - 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 Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
 - 3. Fasteners for Zinc Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- E. Butyl Sealant: ASTM C 1311, 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. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.03 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. 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.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: 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 as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: 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.
- I. Do not use graphite pencils to mark metal surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - 5. Install sealant tape where indicated.
 - 6. Torch cutting of sheet metal flashing and trim is not permitted.
 - 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
 - 1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as shown and as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.03 ERECTION 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 as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.04 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On

completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

- D. 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.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Roof curbs.
 - 2. Equipment supports.
- B. Related Requirements:
 - 1. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.03 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
 - 1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 - 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to be included in operation and maintenance manuals.

1.07 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
 - 1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.02 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AES Industries, Inc.
 - b. Conn-Fab Sales, Inc.
 - c. Greenheck Fan Corporation.
 - d. KCC Manufacturing.
 - e. Lloyd Industries, Inc.
 - f. Pate Company (The).
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
- D. Steel: Aluminum-zinc alloy-coated steel sheet, 0.064 inch thick.
 - 1. Finish: Factory prime coating .
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - 3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 - 4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.03 PREFABRICATED PIPE (AND DUCTWORK) SUPPORTS

- A. Provide adjustable piping support products as manufactured by Roof Top Blox, 500 Distribution Parkway, Collierville, TN 38017, Model RTB-01, or equal product(s) as submitted to, and approved by, the Architect.
 - 1. Materials: Support base shall be manufactured from 25 PSI plastic with a base not less than 9 inches by 9 inches by 1-inch thickness (nominal). Plastic may be from recycled products. Supports shall be manufactured to permit secure insertion of an elevated, vertical, galvanized steel post or threaded rod. Post or rod shall be vertically-adjustable to permit alignment of supported element.
 - 2. Pipe Clamps for Ductwork: Provide post or rod shall fitted with a circular, galvanized steel split-ring clamp to support and secure the duct. Provide clamping assemblies that do not crush pipe insulation.
 - 3. Provide manufacturer's standard roof adhesive for attaching the support base to the roof membrane. In lieu of an adhesive product by the pipe support manufacturer, substitute an adhesive approved for use by the roof membrane manufacturer.
 - 4. Coordinate installation with materials and systems furnished and installed as specified in Division 23 and detailed on the Mechanical Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- 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 stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks. Level all equipment supports and rails as required for proper installation and operation of mechanical or electrical equipment placed thereupon.
- D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.03 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 Painting sections.
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

**SECTION 078400
FIRESTOPPING**

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

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

1.02 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.03 RELATED REQUIREMENTS

- A. Section 017000 - Execution and Closeout Requirements: Cutting and patching.
- B. Section 078446 - Fire-Resistive Joint Systems.
- C. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.
- D. Related Sections include the following:
 - 1. Division 22 and 23 Sections specifying duct and piping penetrations.
 - 2. Division 26 Sections specifying cable and conduit penetrations.

1.04 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- B. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.
- C. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.
- D. FM 4991 - Approval Standard of Firestop Contractors; 2013.
- E. FM (AG) - FM Approval Guide; current edition.
- F. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- G. UL (DIR) - Online Certifications Directory; Current Edition.
- H. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside fire-resistance-rated shaft enclosures.
 - 3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings indicated at both ambient temperatures and 400 deg F.

- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1.06 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals:
 - 1. Submit VOC content documentation for nonpreformed materials.
- C. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- D. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- E. Qualification Data: For Installer.
- F. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
 - 1. Grace, W. R. & Co. - Conn.
 - 2. Hilti, Inc.
 - 3. Johns Manville.
 - 4. Nelson Firestop Products.
 - 5. Specified Technologies Inc.
 - 6. 3M; Fire Protection Products Division.
 - 7. Tremco; Sealant/Weatherproofing Division.

2.02 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

2.03 FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

2.04 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- H. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.05 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.03 INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 - 1. 1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

3.05 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with the requirements.

3.06 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.07 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Mildew-resistant joint sealants.
 - 3. Latex joint sealants.
 - 4. Preformed joint sealants.
 - 5. Acoustical joint sealants.
- B. Related Requirements:
 - 1. Division 08 Section 084113, "Aluminum-Framed Storefronts and Entrances" for additional instructions for sealing exterior and interior sides of aluminum framing members to adjacent construction.
 - 2. Division 08 Section "Glazing" for glazing sealants.
 - 3. Division 09 Section 092900, "Gypsum Board" for sealing perimeter joints.

1.03 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- B. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

1.04 ACTION SUBMITTALS

- A. Product Data:
 - 1. Joint sealants.
- B. Joint-Sealant Schedule: Include the following information:
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

- A. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.

1.06 CLOSEOUT SUBMITTALS

- A. Manufacturers' special warranties.
- B. Installer's special warranties.

1.07 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver sufficient samples to manufacturer for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.09 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

2.01 SOURCE LIMITATIONS

- A. Obtain joint sealants from single manufacturer for each sealant type.

2.02 JOINT SEALANTS - GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content: Verify sealants and sealant primers comply with the following:

1. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
2. Architectural sealants have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for porous substrates have a VOC content of 775 g/L or less.
4. Sealants and sealant primers for nonporous substrates have a VOC content of 250 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.03 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. Pecora Corporation; 301 NS, 311 NS, 890, or 890FTS.
 - c. Sika Corporation, Construction Products Division; SikaSil WS-290.
 - d. Tremco Incorporated; Spectrem 1 or Spectrem 800.
- B. Silicone, S, NS, 50 NT: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 795.
 - b. Pecora Corporation; 864, 895 or 898.
 - c. Sika Corporation, Construction Products Division; SikaSil WS-295.
 - d. Tremco Incorporated; Spectrem 2 or Spectrem 3.

2.04 URETHANE JOINT SEALANTS

- A. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Pecora Corporation, Dynatrol II.
 - a. Polymeric Systems, Inc.; PSI-270.
 - b. Tremco Incorporated; Dymeric 240 FC.
- B. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T and NT.
1. Polymeric Systems, Inc.; PSI-270.
 2. Tremco Incorporated; Dymeric 240 FC.

2.05 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation, AC-20+ or AC-20 FTR.

- b. Tremco Incorporated, TremFlex 834.
- c. Bostik, Inc.; Chem-Calk 600.

2.06 PREFORMED JOINT SEALANTS

- A. Preformed Silicone Joint Sealants: Manufacturer's standard seal consisting of precured low-modulus silicone extrusion, with a neutral-curing silicone sealant for bonding extrusions to substrates.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. Pecora Corporation; Sil-Span.
 - c. Tremco Incorporated; Spectrem Simple Seal.
 - 2. Joint Seal Width: Joint size indicated on Drawings plus 0.75 inch.
 - 3. Joint Seal Color: As selected by Architect from full range of custom colors.
- B. Preformed, Foam Joint Seals: Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
 - b. MM Systems Corporation; EIF EIS SIF.
 - c. Tremco Incorporated; ExoAir Eco
 - 2. Design Criteria:
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Minimum Joint Width: As indicated on Drawings.
 - c. Maximum Joint Width: As indicated on Drawings.
 - d. Movement Capability: -25 percent/+25 percent.
 - 3. Joint Seal Color: As selected by Architect from full range of custom colors.

2.07 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Pecora Corporation; AC-20 FTR.
 - 2. Pecora Corporation; AIS-919.
 - 3. USG Corporation; SHEETROCK Acoustical Sealant.

2.08 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Adfast.
 - b. Alcot Plastics Ltd.
 - c. Construction Foam Products; a division of Nomaco, Inc.
 - d. Master Builders Solutions.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application

indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.09 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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. 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.

3.03 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. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. 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.
- G. 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.

3.04 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. of joint length for each kind of sealant and joint substrate.
 - 2) Perform one test for each 1000 ft. of joint length thereafter or one test per each floor per elevation.
 - b. Test Method: Test joint sealants in accordance with 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.

3.05 CLEANING

- A. 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.

3.06 PROTECTION

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

3.07 JOINT SEALANT SCHEDULE

- A. General: Typical for all joint sealant applications, **all colors shall be selected by Architect from manufacturer's full range of colors.**
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Joints between different materials listed above.
 - c. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - d. Control and expansion joints in ceilings and other overhead surfaces.
 - 2. Joint Sealant:
 - a. Silicone S NS 100/50 NT.
 - b. Silicone, S, NS, 50 NT.
- C. Joint-Sealant Application: Interior joints at the interior of window perimeters.
 - 1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of exterior windows
 - 2. Joint Sealant:
 - a. Silicone S NS 100/50 NT.
 - b. Silicone, S, NS, 50 NT.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - 2. Joint Sealant:

- a. Latex OP NF.
- E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Location:
 - a. Acoustical joints where indicated.
 - b. At partition wall perimeters between classrooms and offices.
 - 2. Joint Sealant:
 - a. Acoustical.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Standard and custom hollow metal doors and frames.
- B. Related Sections:
 - 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
 - 4. Division 08 Section "Door Hardware".
 - 5. Division 09 Sections "Interior Painting" for field painting hollow metal doors and frames.
- C. Codes and References: Comply with the version 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.

1.03 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 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.

1.04 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. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. when tested according to ASTM C 518.
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.05 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.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.07 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.

1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).
 - 3. Steelcraft (S).

2.02 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.

2.03 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. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
 - 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.

5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Manufacturers Basis of Design:
1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.04 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings. Knock-down frames are NOT permitted.
 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - M Series.
- C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

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

2.06 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.

2.07 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 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. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with loose wiring harness (not attached to open throat components or installed in closed mullion tubes) and standardized Molex™ plug connectors on one end to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
9. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
 - a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
 - b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
 - c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
 - d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
10. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
11. 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.
12. 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".
13. 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.

- D. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.08 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

3.01 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.

3.02 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.

3.03 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. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 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.

3.05 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

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENT

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

1.02 SUMMARY

- A. Section Includes
 - 1. Solid-core flush wood doors with wood-veneer-faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for metal door frames.
 - 2. Division 08 "Door Hardware" for door hardware.
 - 3. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Door core materials and construction.
 - 2. Door edge construction
 - 3. Door face type and characteristics.
 - 4. Door louvers.
 - 5. Door trim for openings.
 - 6. Door frame construction.
 - 7. Factory-machining criteria.
 - 8. Factory- priming specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
 - 1. Door schedule indicating door location, type, size, fire protection rating, and swing.
 - 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
 - 3. Details of frame for each frame type, including dimensions and profile.
 - 4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 5. Dimensions and locations of blocking for hardware attachment.
 - 6. Dimensions and locations of mortises and holes for hardware.
 - 7. Clearances and undercuts.
 - 8. Requirements for veneer matching.
 - 9. Doors to be factory finished and application requirements.
 - 10. Apply AWI Quality Certification Program label to Shop Drawings.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Allow three (3) weeks for processing submittal and (2) two weeks for processing each resubmittal.

1.04 QUALITY ASSURANCE

- A. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.
- D. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations, as well as manufacturer's instructions.
- E. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.06 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.
 - 2. Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.07 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty also includes installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.
 - 4. Warranty Period for Hollow-Core Interior Doors: Manufacturer's standard number of year(s) from date of Substantial Completion.
 - 5. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or voiding of manufacturer's warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.02 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards." ANSI/WDMA I.S. 1A.
 - 1. Provide labels from AWI certification program indicating that doors comply with requirements of grades specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

- B. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
- D. Wood Veneers: All wood veneers for Project, for each species, despite trade, regardless of use, must be coordinated with the Contractor, and be purchased from the same vendor and flitch selection.

2.03 SOLID-CORE FLUSH WOOD DOORS WITH WOOD-VENEER FACES

- A. Interior Doors, Solid Core See drawings:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Masonite Architectural - ASSA ABLOY Group company, including Graham and Maiman.
 - b. Oregon Door.
 - c. VT Industries, Inc.
 - 2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty .
 - 3. ANSI/WDMA I.S. 1A Grade: Premium.
 - 4. Grade: Premium with Grade A faces.
 - 5. Species: Select Red Oak.
 - 6. Cut: Rift Sawn.
 - 7. Match between Veneer Leaves: Book match.
 - 8. Assembly of Veneer Leaves on Door Faces: Book match.
 - 9. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - 10. Exposed Vertical Edges: Same species as edges.
 - 11. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as follows:
 - (a) 5-inch top-rail blocking, in doors indicated to have closers.
 - (b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - (c) 5-inch midrail blocking, in doors indicated to have exit devices.
 - 2) Provide doors with WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
 - b. Glued wood stave.
 - c. WDMA I.S. 10 structural composite lumber.
 - 1) Screw Withdrawal, Door Face: 700 lbf.
 - 2) Screw Withdrawal, Vertical Door Edge: 400 lbf.
 - d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.
 - 12. Structural-Composite-Lumber-Core Doors (at full glass doors):
 - a. Structural Composite Lumber: WDMA I.S.10.
 - 1) Screw Withdrawal, Face: 700 lbf.
 - 2) Screw Withdrawal, Edge: 400 lbf.
 - 13. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - a. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

- b. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - c. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
14. Construction:
- a. Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before faces and crossbands are applied.

2.04 LOUVERS AND LIGHT FRAMES

- A. Metal Louvers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Louvers Inc.
 - b. Anemostat; a Mestek company.
 - 2. Blade Type: Vision-proof, inverted V.
 - 3. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.
- B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
- 1. Wood Species: Same species as door faces .
 - 2. Profile: Flush rectangular beads .
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.05 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
- 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
- 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
- C. Transom and Side Panels:
- 1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
 - 2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 3. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
- 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Louvers: Factory install louvers in prepared openings.
 - 3. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.06 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
- 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

2. Finish faces, all four edges, edges of cutouts, and mortises.
 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
1. ANSI/WDMA I.S. 1A Grade: Premium.
 2. ANSI/WDMA I.S. 1A TR-4 Conversion Varnish.
 3. Staining: Match Architect's sample – to match existing building door color.
 4. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Install frames level, plumb, true, and straight.
1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- F. Lite Trim: Set nails at stops. Fill with putty to match door finish.

3.03 FIELD QUALITY CONTROL

- A. Inspections:
1. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.04 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 083100
ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames.
- B. Related Requirements
 - 1. Division 23 for heating and air-conditioning duct access doors.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Concealed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
 - c. Milcor; Hart & Cooley, Inc.
 - d. Nystrom, Inc.

2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
3. Optional Features: Piano hinges.
4. Locations: Provide access doors where required for plumbing, electrical, or HVAC access through gypsum walls and ceilings.
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch , 16 gage, factory primed.
6. Frame Material: Same material and thickness as door.
7. Latch and Lock: Cam latch, key operated with interior release.

2.02 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.03 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
 2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
 1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.
- E. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 2. Keys: Furnish two keys per lock and key all locks alike.

2.04 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.
 - a. Color: As indicated by manufacturer's designations As selected by Architect from full range of industry colors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.03 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

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. Storefront framing for punched openings.
- B. Related Requirements:
 - 1. Division 07 Section "Joint Sealants" for joint sealants installed as part of the aluminum storefront system.
 - 2. Division 08 Section "Glazing" for glazing units.

1.03 PREINSTALLATION MEETINGS

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

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

1.05 INFORMATIONAL SUBMITTALS

- A. Certificates:
 - 1. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- B. Test and Evaluation Reports:
 - 1. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by qualified testing agency .
- C. Field Quality-Control Submittals:
 - 1. Field quality-control reports.
- D. Sample warranties.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For aluminum-framed entrances and storefronts.

1.07 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or 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. Noise or vibration created by wind and thermal and structural movements.
 - c. Water penetration through fixed glazing and framing areas.
 - d. Failure of operating components.
 - 2. Warranty Period: One years from date of Substantial Completion.
- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. 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. Warranty Period: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Structural Loads:
 - 1. Wind Loads:
 - a. Basic Wind Speed (ASCE 7-10, 3-sec peak gust): 115 mph.
 - b. Risk Category: II
 - c. Importance Factor: 1.
 - d. Exposure Category: B.
 - 2. Seismic Loads: $S_s=1.5g$; $S_1=.05g$; Soil Site Class D; an Occupancy Category II.
- C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches .
 - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch .
- D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .
- F. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):
 - a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.38 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
 - b. Operable Windows: Whole window U-factor of not more than 0.60 Btu/sq. ft. x h x deg F (3.40 W/sq. m x K) as determined in accordance with NFRC 100.
 2. Solar Heat-Gain Coefficient (SHGC):
 - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.35 as determined in accordance with NFRC 200.
 - b. Operable Windows: Whole window SHGC of not more than 0.35 as determined in accordance with NFRC 200.
 3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283.
 - b. Operable Windows: Whole window air leakage of not more than 0.3 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 4. Condensation Resistance Factor (CRF):
 - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
 - b. Operable Windows: Whole window CRF of not less than 55 as determined in accordance with AAMA 1503.
- G. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.03 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.04 EXTERIOR STOREFRONT SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer VersaGlaze 451T or comparable product by one of the following:
 1. Oldcastle Building Envelope (OBE); CRH Americas, Inc.
 2. U.S. Aluminum; C.R. Laurence Co., Inc.; CRH Americas, Inc.
 3. EFCO Corporation.
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Exterior Framing Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: Center.
 4. Finish: High-performance organic finish .
 5. Fabrication Method: Field-fabricated stick system.
 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 7. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.05 OPERABLE VENT WINDOWS

- A. Manufacturer's standard units, complying with AAMA/WDMA/CSA 101/I.S.2/A440, with self-flashing mounting fins, and as follows:
1. Window Type: Awning.
 2. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
 - a. Cam handle operator system, with steel or bronze operating arms.
 3. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
 4. Limit Devices: Concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening.
 - a. Limit clear opening to 4 inches for ventilation; with custodial key release.
 5. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit, complying with SMA 1004 or SMA 1201, and as follows:
 - a. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted, provide full panel screen hinged at the top of window unit..
 - b. Fabric: Manufacturer's standard aluminum wire fabric charcoal color.
 6. Glazing: Same as adjacent aluminum-framed entrances and storefront glazing.
 7. Finish: Match adjacent aluminum-framed entrances and storefront finish.

2.06 MATERIALS

- A. Sheet and Plate: ASTM B209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- C. Structural Profiles: ASTM B308/B308M.
- D. Steel Reinforcement:
1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.07 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.

- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.
- C. Prefinished Aluminum Extruded Sill: **Provide extruded sills at all storefront systems** and as indicated in drawings with factory furnished endams. Color and finish shall match storefront. Provide 0.080-inch extruded extended sills where required to extend past face of exterior wall.
- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.08 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior or interior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using screw-spline system .
- F. Operable Windows: All aluminum frame and vent extrusions shall have a minimum wall thickness of 0.80-inches. Frame depth shall not exceed 3 1/16-inch. Each vent shall be pressure equalized utilizing two rows of EPDM weather stripping installed in specifically designed dovetail grooves in the extrusion. Screen mounting holes in the window frame shall be factory drilled.

2.09 ALUMINUM FINISHES

- A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 50 percent PVDF resin by weight in color coat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 - 2. Color and Gloss:
 - a. Basis of design: Color shall be selected from manufacturer's standard colors to match existing storefront frame color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.

- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation. All sill flashing shall feature end dams and the jamb detail shall be carefully integrated with the sill flashing.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.
- K. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation. Provide 3/8 inch joints at head and jamb for installation of backer rod and concave sealant joint. Fillet joints will not be accepted.

3.03 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 088000 "Glazing."

3.04 ERECTION TOLERANCES

- A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections: Perform the following tests on representative areas of aluminum-framed entrances and storefronts.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Architect.
 - 2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - a. Perform a minimum of three tests in areas as directed by Architect.
 - 3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

- C. Prepare test and inspection reports.

END OF SECTION

**SECTION 087100
DOOR HARDWARE**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. **Keying: The Owner shall be responsible for providing permanent keying. Owner will be responsible for keying for providing permanent keys. Contractor shall be responsible for securing the facility until permanent locks are installed.**
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- 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. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
 - 8. 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.

1.03 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. Substitutions: Comply with Division 1. Refer to Part 2 paragraph "Manufacturers" herein for Owner's proprietary requirements and limitations on substitute or alternate products by other manufacturers. For items listed as "No Substitutions, provide products from manufacturers exactly as specified.
- C. 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.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.04 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.
- 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 and finalize construction schedule and verify availability of materials.
 - 4. 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.

1.05 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".

1.06 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.

1.07 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.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.08 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

2.01 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.

2.02 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.

- c. dormakaba Best (ST) - F/FBB Series, 5 knuckle.
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 - 1. Manufacturers:
 - a. Hager Companies (HA).
 - b. Pemko (PE).
 - c. Dormakaba Best (ST).

2.03 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 5. Manufacturers:
 - a. Door Controls International (DC).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 - 1. Manufacturers:
 - a. Door Controls International (DC).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.04 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.
 - 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU).
 - b. Sargent Manufacturing (SA).
- 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: Match Facility 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: Three (3).
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
 4. Construction Control Keys (where required): Two (2).
 5. Permanent Control Keys (where required): Two (2).
- 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.

2.05 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.
1. Locks shall meet or exceed the requirements of ANSI/BHMA A156.2 Series 4000, Grade 1 with all standard trims, as follows:
 - a. Cycle Test: ANSI/BHMA A156.2 Grade 1 requirements with no lever sag.
 - b. Abusive Locked Lever Torque: Exceed 3,100 in-lb with no entry; lock to maintain egress functionality in compliance with BHMA certification requirements.
 - c. Offset Lever Pull: Exceed 1,600 lbs with no entry (8 times ANSI/BHMA A156.2 requirements).
 - d. Latch Retraction with Preload: Exceed 100 lb preload while maintaining ANSI/BHMA requirements for operation in warped doors (2 times ANSI/BHMA A156.2 requirements).
 2. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).
 3. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 4. Locks are to be non-handed and fully field reversible.
 5. Manufacturers:
 - a. Sargent Manufacturing (SA) - 10X Line.
 - b. No Substitution.

2.06 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. 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.

2.07 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as

- required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Von Duprin (VD) - 35A/98 XP Series.
 - b. No Substitution.

2.08 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 (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.
1. Manufacturers:

- a. LCN Closers (LC) - 1450 Series.
- b. No Substitution.

2.09 ARCHITECTURAL TRIM

- A. Door Protective Trim
 - 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 - 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
 - 3. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
 - 4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
 - 5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.10 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. Hiawatha, Inc. (HI).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- 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. dormakaba (DO).
 - b. Norton Rixson (RF).
 - c. Sargent Manufacturing (SA).

2.11 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. 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 at all rated door assemblies.
- C. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- D. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko (PE).
 3. Reese Enterprises, Inc. (RE).

2.12 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.

2.13 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

3.01 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.

3.02 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.08 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 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. RO - ROckwood
 4. VD - Von Duprin
 5. SA - SARGENT
 6. RU - Corbin Russwin
 7. HS - HES
 8. RF - Rixson
 9. NO - Norton
 10. LC - LCN Closers

HARDWARE SETS

SET: 1.0

DOORS: 103.2, 103.4, 103.5

3	HINGE	TA2714	US26D	MK
1	STOREROOM/CLOSET LOCK	10XG04 LL L	US26D	SA
1	SURFACE CLOSER	1461 REG / EDA (TO SUIT)	689	LC
1	KICK PLATE	K1050 10" CSK	US32D	RO
1	OVERHEAD STOP	10-X36	630	RF
3	SILENCER	608/609 (TO SUIT)		RO

SET: 2

DOORS: 102.1

6	HINGE (HEAVY WEIGHT)	T4A3386	US32D	MK
1	EXIT ONLY EXIT DEVICE	CD 99 EO	626	VD
1	NIGHTLATCH EXIT DEVICE	CD 99 NL-OP 110MD-NL	626	VD
3	MORTISE CYLINDER	10 40 SERIES (CAM/LENGTH TO SUIT)	US32D	SA
1	RIM CYLINDER	10 34	US32D	SA
2	SURFACE CLOSER	4040XP SCUSH	689	LC
1	THRESHOLD	252X3AFG MSES25SS		PE
2	DOOR POSITION SWITCH	DPS-M/W-BK (TO SUIT)		SU
1	GASKETING	5110BL		PE
2	SWEEP (W/ DRIP EDGE)	3452CNB		PE

NOTES: • PERIMETER/MEETING STILE SEALS BY DOOR SUPPLIER. • ELECTRONIC OPERATION: VALID CARD OR KEY RETRACTS LATCH. REQUEST TO EXIT SHOWS AUTHORIZED EGRESS. FREE EGRESS AT ALL TIMES. IN CASE OF POWER LOSS, DOOR REMAINS LOCKED AND LATCHED. OWNER WILL FURNISH AND INSTALL CARD ACCESS READER SYSTEM AND ALL HARDWARE.

SET: 3				
DOORS: 100.1, 103.3				
6	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK
2	RIM EXIT DEVICE	99 L 996L 06	626	VD
2	RIM CYLINDER	34 L	US32D	SA
1	CYLINDER	980C1 L	US26D	SA
2	SURFACE CLOSER	1461 REG / EDA (TO SUIT)	689	LC
2	KICK PLATE	K1050 10" CSK	US32D	RO
2	DOOR STOP	403/441CU (TO SUIT)	US26D	RO
2	SILENCER	608/609 (TO SUIT)		RO
NOTES: ELECTRONIC OPERATION: VALID CARD OR KEY RETRACTS LATCH. REQUEST TO EXIT SHOWS AUTHORIZED EGRESS. FREE EGRESS AT ALL TIMES. IN CASE OF POWER LOSS, DOOR REMAINS LOCKED AND LATCHED. OWNER WILL FURNISH AND INSTALL CARD ACCESS READER SYSTEM AND ALL HARDWARE.				
SET: 4				
DOORS: 100.2, 102.2, 103.1				
3	HINGE (HEAVY WEIGHT)	T4A3786	US26D	MK
1	RIM EXIT DEVICE	99 L 996L 06	626	VD
1	RIM CYLINDER	34 L	US32D	SA
1	ELECTRIC STRIKE (DOOR 103.1)	1600-CS	630	HS
1	CYLINDER	980C1 L	US26D	SA
1	SURFACE CLOSER	1461 CUSH	689	LC
1	KICK PLATE	K1050 10" CSK	US32D	RO
1	SILENCER	608/609 (TO SUIT)		RO
NOTES: NOTES: AT DOOR 103.1 ONLY – ELECTRONIC OPERATION: VALID CARD OR KEY RETRACTS LATCH. REQUEST TO EXIT SHOWS AUTHORIZED EGRESS. FREE EGRESS AT ALL TIMES. IN CASE OF POWER LOSS, DOOR REMAINS LOCKED AND LATCHED. OWNER WILL FURNISH AND INSTALL CARD ACCESS READER SYSTEM AND ALL HARDWARE.				

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors and frames.
 - 2. Storefront Entrances and Framing.
 - 3. Glass products.
 - 4. Insulating glass.
 - 5. Glazing sealants.
 - 6. Glazing tapes.
 - 7. Insulating glass units.
- B. Related Requirements:
 - 1. Division 08 Section "Wood Doors".
 - 2. Division 08 Section "Aluminum-Framed Entrances and Storefronts".

1.03 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.04 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
 - 1. Coated glass.
 - 2. Insulating glass.
 - 3. Insulating glass with Acid Etched glass lite.
 - 4. Insulating glass with colored PVB interlayer.
 - 5. Colored gel film applied to insulating glass - one sample per selected color.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Decorative Glass Film Samples: 4 inch by 4 inch samples of texture, color and/or pattern for verification.

1.06 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.

- B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Field measurements shall be taken prior to completion of manufacturing and cutting of glazed-in metal panels.
- E. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" (3mm) in 20' (6m) non-commutative.
- F. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
- G. Safety Glazing Labeling: Where safety glazing labeling 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.
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.09 WARRANTY

- A. 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

2.01 MANUFACTURERS

- A. Source Limitations for Glass: Obtain glass from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. 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.
 - a. Wind Design Data: As indicated.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 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. For monolithic-glass lites, properties are based on units with lites 6 mm thick .
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. U-Factors: Center-of-glazing values, 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.
 - 5. 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.
 - 6. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.03 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: "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.
 - 1. Minimum Glass Thickness for Exterior Lites: 1/4-inch 6 mm .
- 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.

2.04 GLASS PRODUCTS

- A. 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.
- B. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viracon; VNE1-63 on clear or comparable product by one of the following:
 - a. Guardian Industries Corp.
 - b. Saint-Gobain Glass Corp.
 - c. Vitro Architectural Glass.
 - d. Pilkington North America.

2.05 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.
 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 2. Interlayer: Ionoplast structural material.
 - a. Trosifol "SentryGlas," as manufactured by Trosifol, a division of Kuraray America, Inc.; or equal.
 - b. Thickness: 0.060-inch.
 - c. Color: Clear.
 - d. Interlayer Physical Properties:
 - 1) Young's Modulus: 43 kpsi, when tested in accordance with ASTM D5026.
 - 2) Tensile Strength: 5.0 kpsi, when tested in accordance with ASTM D638.
 - 3) Elongation: 400%, when tested in accordance with ASTM D638.
 - 4) Flex Modulus: 50 kpsi, when tested in accordance with ASTM D790.
 - 5) Heat Deflection Temperature at 0.46 MPa: 110 deg F, when tested in accordance with ASTM D648.
 3. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 4. Interlayer Color: Clear unless otherwise indicated.

2.06 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 polyisobutylene and silicone primary and secondary sealants.
 2. Perimeter Spacer: Manufacturer's standard spacer material and construction Aluminum with mill or clear anodic finish.
 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.07 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. EPDM complying with ASTM C 864.
 2. Neoprene, complying with ASTM C 864.
 3. Silicone complying with ASTM C 1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, neoprene, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

2.08 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. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.
- B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. Pecora Corporation.
 - c. Sika Corporation.
 - d. The Dow Chemical Company.
 - e. Tremco Incorporated.
 2. Applications: Exterior glazing unless otherwise indicated .

2.09 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.

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. 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.
- D. Spacers:
1. Elastomeric material 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.
- E. Edge Blocks:
1. Elastomeric material with Shore A durometer hardness per manufacturer's written instructions.
 2. Type recommended in writing by sealant or glass manufacturer.

2.11 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.03 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.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.04 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. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. 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.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances 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.

3.06 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do 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.

3.07 MONOLITHIC GLASS SCHEDULE

- A. Clear Glass Type **GL-1** : Fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.
 - 3. Location: All interior glass.
- B. Clear Glass Type **GL-1A**; Fully tempered float glass
 - 1. Minimum Thickness: 6 mm.
 - 2. Product: FireLite.
 - 3. Film: Fire-rated surface film as approved by manufacturer.
 - 4. Safety glazing required.

5. Location: All interior glass required to be rated by Building Code.

3.08 INSULATING GLASS SCHEDULE

- A. Low-E-Coated, Low Iron Clear Insulating Glass Type **GL-2** Insulated glass - clear:
1. Basis-of-Design Product: Viracon VNE1-63.
 2. Overall Unit Thickness: 1 inch.
 3. Minimum Thickness of Each Glass Lite: 6 mm.
 4. Outdoor Lite: Fully tempered float glass.
 5. Interspace Content: Argon.
 6. Indoor Lite: Fully tempered float glass.
 7. Low-E Coating: Sputtered on second surface.
 8. System: 1/4 inch clear with VNE-63 #2, + 1/2 inch space, argon filled + 1/4 inch clear glass.
 9. Winter Nighttime U-Factor: 0.25 maximum.
 10. Summer Daytime U-Factor: 0.21 maximum.
 11. Visible Light Transmittance: 62 percent minimum.
 12. SGHC: 0.28 maximum.
 13. Safety glazing required.
 14. Location: Typical Exterior Insulated Glazing Unit.

END OF SECTION

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
- B. Related Requirements:
 - 1. Division 09 Section "Gypsum Board".

1.02 ACTION SUBMITTALS

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

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Notify manufacturer of damaged materials received prior to installation.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 FRAMING SYSTEMS

- A. Framing Members, General: Comply with AISI S220 for conditions indicated.
 - 1. Steel Sheet Components: Comply with AISI S220 requirements for metal unless otherwise indicated
 - 2. Protective Coating: Comply with AISI S220; ASTM A653/A653M, G40; or coating with equivalent corrosion resistance. Galvannealed products are unacceptable.
 - a. Coating demonstrates equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.
- B. Studs and Track: AISI S220.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. ClarkDietrich.
 - c. Marino\WARE.
 - d. MRI Steel Framing, LLC.
 - e. Steel Construction Systems.
 - 2. Minimum Base-Steel Thickness: 0.0269 inch.
 - 3. Depth: As indicated on Drawings.
- C. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. CEMCO; California Expanded Metal Products Co.
 - b. ClarkDietrich.
 - c. MBA Building Supplies.
 - d. Steel Construction Systems.
 - e. Steel Network, Inc. (The).
 - f. Minimum Base-Steel Thickness: 0.0190 inch or 20 gauge.
 - g. Depth: As indicated on Drawings.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 1. Single Long-Leg Track System: ASTM C645 top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) ClarkDietrich.
 - 3) Marino\WARE.
 - 4) Steel Network, Inc. (The). VertiClip SLD VertiTrack VTD Series.
 - 5) Superior Metal Trim; Superior Flex Track System (SFT).
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich.
 - b. Marino\WARE.
 2. Minimum Base-Steel Thickness: As indicated on Drawings 0.0329 inch.
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C645.
 1. Minimum Base-Steel Thickness: 0.0329 inch.
 2. Depth: As indicated on Drawings.
- H. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
 1. Configuration: hat shaped.
- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: 3/4 inch .
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

2.03 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
- B. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.
 - 1. Depth: 2-1/2 inches.
- E. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
 - 2. Steel Studs and Tracks: ASTM C645.
 - a. Minimum Base-Steel Thickness: 0.0329 inch.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
 - a. Minimum Base-Steel Thickness: 0.0329 inch.
 - 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong Ceiling & Wall Solutions.
 - b. Certainteed; SAINT-GOBAIN.
 - c. Rockfon; ROCKWOOL International.
 - d. USG Corporation.

2.04 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
 - 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.03 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.05 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches o.c.
 - 2. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards .
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 092900
GYPSUM BOARD

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
 - 2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
 - 3. Division 09 Section "Painting" for primers and paint applied to gypsum board surfaces.

1.02 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Gypsum wallboard.
 - 2. Abuse-resistant gypsum board.
 - 3. Joint treatment materials.
 - 4. Sound-attenuation blankets.
 - 5. Acoustical sealant.
- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
- D. Samples for Initial Selection: For each type of trim accessory indicated.

1.03 QUALITY ASSURANCE

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.05 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. 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.
- B. Verify ceiling and wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.02 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.

2.03 INTERIOR GYPSUM BOARD

- A. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.
 - 1. Location: All locations.
 - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum., M-BLOC Abuse Resistant Type X.
 - b. Georgia-Pacific Building Products, ToughRock® Fireguard X® Mold-Guard™ Abuse-Resistant Gypsum Board.
 - c. National Gypsum Company, Gold Bond® Hi-Abuse® XP® Gypsum Board.
 - d. USG Corporation, Sheetrock® Brand Mold Tough® AR Firecode® X Panels.
 - 3. Core: 5/8-inch, Type X.
 - 4. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
 - 5. Indentation: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
 - 6. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
 - 7. Long Edges: Tapered.
 - 8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.04 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet .
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - d. Stockton Products.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.05 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit 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 setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use compound.

2.06 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Verify adhesives have a VOC content of 50 g/L or less.
 - 2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. 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 thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. 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.
- E. Moldable putty for application to electrical boxes and other penetrations of acoustic barriers.
 - 1. Pre-formed 1/8-inch pads.
 - 2. Non-toxic, asbestos-free.
 - 3. Acceptable Product and Manufacturer:
 - a. Quiet Putty QP-380 by Quiet Solution.
 - b. Outlet Box Pads by Harry A. Lowry & Associates.
- F. Acoustical Sealant: As specified in Section 079200 "Joint Sealants."
 - 1. Verify sealant has a VOC content of 250 g/L or less.
- G. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Verify that project conditions are appropriate for work of this section to commence.

3.02 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- 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.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces unless otherwise indicated.
 - 2. Abuse-Resistant Type: At all walls to 8'-0" AFF.
 - 3. Mold-Resistant Type: Toilet rooms, janitor rooms and mechanical rooms.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.04 INSTALLATION OF TRIM ACCESSORIES

- A. General: 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.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.

3.05 FINISHING OF GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. 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.
 - a. Embed tape at joints unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 2. Level 4: At wall and ceiling surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Painting."
 - b. At surfaces prepared for vinyl wall protection covering (WC-2) specified in section 097200 "Wall Coverings"
 - c. Embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

3.06 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095113
ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for interior ceilings.
- B. Related Requirements:
 - 1. Division 09 Section 092900 "Gypsum Board" for gypsum board to be applied over metal stud-framed soffits.
 - 2. Division 26 specifications on the Electrical Drawings for lighting fixtures in acoustical ceilings.
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

1.04 CLOSEOUT SUBMITTALS

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

1.05 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. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.

1.06 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.08 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and

ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. Verify ceiling products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: Class A according to ASTM E 1264.
 2. Smoke-Developed Index: 50 or less.

2.03 ACOUSTICAL PANELS (ACP-1)

- A. Manufacturers:
 1. Acoustic Tile Panels:
 - a. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide USG – Radar 22521 ceiling panels, or a comparable product from one of the following:
 - b. Armstrong World Industries.
 - c. Rockfon.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 1. Type and Form: Type III, mineral fiber base with painted finish; Form 2, cloth. Binder shall not contain urea formaldehyde.
 2. Pattern: CD (perforated, small holes and fissured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.81.
- F. Noise Reduction Coefficient (NRC): Not less than 0.70.
- G. Edge/Joint Detail: Square.
- H. Thickness: 3/4 inch.
- I. Modular Size: 24" x 24".
- J. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.04 METAL SUSPENSION SYSTEM

- A. Manufacturers: Provide products by same manufacturer as acoustical tile indicated on the drawings.

- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
- C. Wide-Face, Aluminum-Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, G60 coating designation; with prefinished, 15/16-inch- wide aluminum caps on flanges.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. Face Design: Flat, flush.
 - 3. Cap Finish: Painted white.

2.05 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

2.06 WIRE HANGERS, BRACES, AND TIES: PROVIDE WIRES AS FOLLOWS:

- A. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 1. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
- B. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- C. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

2.07 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by the same manufacturer as acoustic ceiling tile as indicated on the drawings.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
 - 1. Basis of Design: Armstrong Axiom Trim.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.03 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member where unexposed to view or with closed edge.
 - a. Where suspended ceiling has exposed or open edges where the area above is visible from below, provide hangers 24-inches from the edge of ceiling system. Engineer hanging system to support edges as required without visible supports.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.04 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet , non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet , non-cumulative.

3.05 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

END OF SECTION

SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.
 - 2. Vinyl molding accessories.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.05 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.02 THERMOSET-RUBBER BASE (RB-1)

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Johnsonite.
 - 3. Roppe Corporation.
 - 4. Mannington Commercial.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style B, Cove.
- C. Thickness: 0.125 inch.

- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors: As selected by Architect from full range of industry colors.

2.03 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Same as rubber base manufacturer.
- B. Description: Carpet edge for glue-down applications, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet Transition strips.
- C. Locations: Provide vinyl molding at all transitions between carpet and terrazzo.
- D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.04 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Verify adhesives have a VOC content of 50 Insert value> g/L or less and 60 g/L or less for rubber stair treads.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.
 - a. Cope corners to minimize open joints.

3.04 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519
RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Installation accessories:
 - 1. Adhesives.

1.02 RELATED REQUIREMENTS

- A. Section 017419 - Construction Waste Management and Disposal.
- B. Section 079200 - Joint Sealants.
- C. Section 079513 - Expansion Joint Cover Assemblies.
- D. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.03 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or Cube Specimens); 2021.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2022.
- D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 SUBMITTALS

- A. Shop Drawings: For each type of resilient floor tile.
- B. Manufacturer's documentation for flooring and accessories:
 - 1. Technical Data.
 - 2. Installation and Maintenance.
 - 3. Warranty.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Verification Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each resilient flooring product specified.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect .
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).
- B. Store all materials flat and off of the floor in an acclimatized, weather-tight space between 65 to 85 degrees F.
- C. Do not double stack pallets.

1.07 FIELD CONDITIONS

- A. Acclimate material at jobsite between 65 to 85 degrees F and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .
- C. Close areas to traffic during installation of flooring and accessories.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
- B. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.02 VINYL COMPOSITION TILE

- A. Manufacturers: Subject to compliance with requirements,:
 - 1. Armstrong World Industries, Inc.; Imperial Texture Standard Excelon.
 - 2. Congoleum Corporation; Alternatives.
 - 3. Johnsonite; Azrock
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile..
- C. Thickness: 0.125 inch.
- D. Size: 12 by 12 inches.
- E. Seamless-Installation Method: Butt seam.
- F. Colors and Patterns: to be selected by the Architect from the manufacturer's full range. Solid color.

2.03 ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Install flooring and accessories after other operations (including painting) have been completed.
- B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
 - 1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.
- C. Verify that substrate is contaminant-free, including old adhesives and abatement chemicals.
- D. Test substrates as required by manufacturer to verify proper conditions exist.
 - 1. Concrete:
 - a. Moisture testing: Perform either the In-Situ Relative Humidity (RH) test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) test (ASTM F1869). Refer to the Manufacturer's Installation Guide/Manual for the maximum allowable substrate moisture content. Substrates above the maximum allowable moisture content will require a moisture mitigation system.
 - b. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - 1) Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - 2) Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 95 percent relative humidity level measurement.
 - c. Perform alkalinity testing per ASTM F710 to verify pH level is between 7 to 10.
 - d. Check substrate for absorbency per manufacturer's recommendations.
 - e. Perform bond testing per ASTM F710 to determine compatibility of adhesive to concrete substrate.

3.02 PREPARATION

- A. Prior to installation, the flooring installer should plan and attend an on-site construction meeting with the General Contractor, Architect and Property Owner to review all requirements and inspect site conditions as outlined in the manufacturer's installation document, as well as to review the requirements of ASTM F710 and any relevant building codes, or local, state, or national regulations.
- B. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.
- C. Prepare per manufacturer's written instructions, Section 01 7000, and as follows:
 - 1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank & Tile.
 - 2. Concrete Substrates: Prepare substrate per ASTM F710.
 - a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
 - b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
 - 1) Do not use solvents or adhesive removers.
 - c. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing,

or both. **There will be no increase to the Contract for additional leveling agents and related labor.**

- 1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
- 2) Sand smooth per manufacturer's instructions.
- d. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.
- e. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
- f. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank & Tile. Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M.
- g. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.

3.03 INSTALLATION

- A. Installation per manufacturer's written instructions, Section 01 7000, and as follows:
 1. Layout shall be specified by Architect, Designer or End User.
 2. Follow layout and ensure installation reference lines are square.
 3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
 4. Check cartons for and do not mix dye lots.
 5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
 - a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
 6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
 - a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
 - b. Periodically spot-check transfer of adhesive to back of tile during installation.
 - c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
 - d. Protect floor from traffic per manufacturer's instructions.
 - e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 CLEANING

- A. Provide progress cleaning per manufacturer's written instructions, Section 01 7000, and as follows:
 1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
 - a. Clean and protect completed construction until Date of Substantial Completion.
 - b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
 2. Site: Maintain project site free of waste materials and debris.
- B. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 7000.
 1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
 2. Clean floor with a neutral 6-8 pH cleaner.

3.05 PROTECTION

- A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.

1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes
 - 1. Modular carpet tile, fully adhered.
- B. Related Requirements:
 - 1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Transition details to other flooring materials.
- D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.

1.08 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.09 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 CARPET TILE

- A. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Basis of Design: Shaw Contract.
 - 2. Interface, Inc.
 - 3. Patcraft.
- B. Product: Elevate 5T388.
- C. Color: As selected from manufacturers full line.
- D. Fiber Type: Manufacturer's standard for products indicated.
- E. Backing System: Manufacturer's standard for products indicated.
- F. Size: 24" x 24".
- G. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.

2.02 INSTALLATION ACCESSORIES

- A. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
 - 1. Verify adhesives have a VOC content of 50 g/L or less.
 - 2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 95 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.03 INSTALLATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive .
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings .
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

3.04 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 097723
FABRIC-WRAPPED PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes fabric-wrapped wall panels.

1.03 SUBMITTALS

- A. Product Data: For each type of panel edge, core material, and mounting indicated.
- B. Shop Drawings: For fabric-wrapped panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- C. Coordination Drawings: Show intersections with doors, electrical outlets and switches, thermostats, air outlets and inlets, speakers, and other adjacent work.
- D. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.
 - 1. Fabric: Full-width by 36-inch- long Sample from dye lot to be used for the Work, and as follows:
 - a. With specified treatments applied.
 - b. Show complete pattern repeat.
 - c. Mark top and face of fabric.
 - 2. Panel Edge: 12-inch-long Sample showing edge profile, corner, and finish.
 - 3. Core Material: 12-inch-square Sample showing corner.
 - 4. Mounting Device: Full-size Sample.
 - 5. Sample Panels: No larger than 36 by 36 inches. Show joints and mounting methods.
 - 6. Qualification Data: For fabricator and testing agency.
 - 7. Maintenance Data: For fabric-wrapped panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.
 - 8. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations: Obtain fabric-wrapped panels through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide fabric-wrapped panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and fabric-wrapped panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
- C. Protect panel edges from crushing and impact.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fabric-wrapped panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install fabric-wrapped panels until a lighting level of not less than 50 fc is provided on surfaces to receive fabric-wrapped panels.
- C. Air-Quality Limitations: Protect fabric-wrapped panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of fabric-wrapped panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped panels that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.
 - 2. Warranty Period: Three years from date of Substantial Completion.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards (9 m).
 - 2. Fabric-Wrapped Panel Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than 5 attachment devices.

PART 2 PRODUCTS

2.01 CORE MATERIALS

- A. Glass-Fiber Board: ASTM C 612, Type IA; density as specified, unfaced, dimensionally stable, molded rigid board, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- B. Impact-Resistant Co-polymer Layer: 1/16-inch- thick layer of resilient perforated co-polymer laminated to face of core.

2.02 FABRIC-WRAPPED PANEL (FWP)

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CONWED Designscape, An Owens Corning Company; "Respond Ultimate 1500 Panels".
- B. Facing Material: Fabric from same dye lot; color and pattern as selected by Architect from manufacturer's full range.
 - 1. Manufacturer: Maharam.
 - 2. Product Line/Pattern: Muse.
 - 3. Style Number: 466487.
 - 4. Color: As selected from manufacturer's full ranged.
 - 5. Fiber Content: 100 percent Polyester.

6. Width: 66 inches.
7. Applied Treatments: Polyester backing.
8. Fabric Application: Railroad.
- C. Panel Core: Provide the following core material:
 1. Composite Core Construction: Glass fiberboard of medium density and dimensionally stable laminated to a resilient perforated copolymer face sheet.(96- to 112-kg/cu. m)(51-mm).
- D. Panel Width and Height: Reference Schedule on Drawings.
- E. Panel Thickness: Reference Schedule on Drawings.
- F. Panel Edge: Resin-hardened, beneath heat-formed co-polymer.
 1. Edge Detail: Square.
 2. Corner Detail: Square to form continuous profile to match edge detail.

2.03 FABRICATION

- A. Fabric-Wrapped Panels: Panel construction consisting of facing material adhered or attached to face, edges and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.
 1. Glass-Fiber Board: Resin harden areas of core for attachment of mounting devices.
- B. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.
 1. Where square corners are indicated, tailor corners.
 2. Where radius or other nonsquare corners are indicated, attach facing material so there are no seams or gathering of material.
 3. Where fabrics with directional or repeating patterns or directional weave are indicated, mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.
- C. Dimensional Tolerances of Finished Units: Plus or minus 1/16-inch for the following:
 1. Thickness.
 2. Edge straightness.
 3. Overall length and width.
 4. Squareness from corner to corner.
 5. Chords, radii, and diameters.
- D. Mounting Devices: Concealed on back of panel, recommended to support weight of panel, with edge-support bracket system where recommended by manufacturer for additional support of panels, and as follows:
 1. Metal "Z" Clips: Two-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to allow for panel removal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine fabric, substrates, blocking, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of fabric-wrapped panels.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Wall Panels: Install fabric-wrapped panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

- B. Comply with fabric-wrapped panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.
- C. Match and level fabric pattern and grain among adjacent panels.
- D. Installation Tolerances: As follows:
 - 1. Variation from Plumb and Level: Plus or minus 1/16 inch.
 - 2. Variation of Panel Joints from Hairline: Not more than 1/32 inch wide.

3.03 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.

3.04 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that fabric-wrapped panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 099123
PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior and exterior substrates:
 - 1. Concrete.
 - 2. Concrete Masonry Units.
 - 3. Galvanized metal.
 - 4. Steel and iron.
 - 5. Exposed structural steel, steel joists and miscellaneous iron, including exposed steel supports, metal grating, dunnage and supports for equipment on roof, except shop priming.
 - 6. Exposed metal roof decking.
 - 7. Exterior and interior metal doors and frames.
 - 8. Exposed metal without a finish coat.
 - 9. Gypsum board.
 - 10. Exterior and Interior exposed structural and miscellaneous steel, and ferrous metals exposed to view.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 08 Sections for factory priming doors and frames with primers specified in this Section.
 - 3. Divisions 21, 22, 23 and 26 Sections for painting requirements related to MEP markings and color codes.
- C. Paint all surfaces in all areas exposed to view in spaces or rooms throughout the area of construction, except spaces above suspended ceilings unless otherwise specified or noted.
- D. "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- E. Paint all exposed surfaces whether or designated in finish schedules, except where natural finish of material or factory prefinishing is specifically noted/provided. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. The Architect will issue a color schedule that will designate surface colors. Contractor shall allow up to 15% deep tone accent walls. Different materials in the same rooms may be designated to receive different colors.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
- C. Submit Draw-Down Samples on rigid backing, 8 inches (200 mm) square.
 - 1. Step coats on Samples to show each coat required for system.
 - 2. Label each coat of each Sample.
 - 3. Label each Sample for location and application area.
- D. 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. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. Indicate VOC content.

1.04 QUALITY ASSURANCE

- A. Preparation and Workmanship: Prepare all surfaces scheduled to receive paint in accordance to manufacturer's instructions. Do not apply primer or paint on surfaces that do not conform to manufacturer's instructions.

1.05 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 50 deg F or more than 80 deg F (7 deg C).
 1. Deliver materials in unopened containers with manufacturer's labels intact.
 2. Maintain containers in clean condition, free of foreign materials and residue.
 3. Remove rags and waste from storage areas daily.

1.06 PERFORMANCE REQUIREMENTS

- A. Interior High Performance Textured Coating: Shall comply with the following requirements:
 1. Fire Rating: Coatings shall be Type 1 or Class A fire-rated, ASTM E 84.
 2. Scrub Test: Greater than 25,000 cycles, ASTM D 2794.
 3. Impact Resistance: Greater than 160 in/lbs, ASTM D 2794.
 4. QUV Accelerated Weathering: Greater than 95 percent gloss retention after 500 hours.
 5. Stain Removal: 8 to 10 for all stains tested, four-hour Open Spot Test.

1.07 PROJECT CONDITIONS

- A. Some manufacturers' products may require higher temperatures for proper curing. Consult manufacturers and revise first paragraph below to suit requirements for specific products if necessary.
- B. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 80 deg F (10 and 35 deg C).
- C. Application areas shall be free of excessive dust.
- D. Maintain minimum 80 footcandles on surfaces to be coated.
- E. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.08 WARRANTY FOR HIGH PERFORMANCE COATINGS

- A. Special Warranty
 1. (10 and 35 deg C): The manufacturer shall warrant the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials for a period of five years from date of Substantial Completion. This special warranty shall extend the one year period of limitations contained in the General Conditions.
- B. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.09 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: The Basis-of-Design products listed in painting schedule are by **The Sherwin-Williams Company**. Subject to compliance with requirements, acceptable alternative manufacturers are:
1. Benjamin Moore & Co.
 2. ICI Paints.
 3. PPG Paints.
 4. Tnemec Company.

2.02 PAINTS, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint 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.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 4. Flat Topcoat Paints: VOC content of not more than 50 g/L.
 5. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 6. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 7. Dry-Fog Coatings: VOC content of not more than 400 g/L.
 8. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 9. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Lead.
 - b. Mercury.
- D. Finishes:
1. Interior Gypsum Ceilings and Soffits: Flat Finish
 2. Interior Trim and CMU Walls: Semi-Gloss Finish
 3. Interior Gypsum Drywall Wall: Eggshell Finish
 4. Interior Hollow Metal Doors and Door Frames – Semi-Gloss Finish
 5. Interior Exposed Ceilings – Semi-Gloss Finish
 6. Exterior Gypsum Ceilings – Eggshell Finish.
 7. Exterior Trim: Semi-Gloss
- E. Colors: As selected by Architect from manufacturer's full range.
- F. Twenty percent of surface area will be painted with deep tones.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMU): 12 percent.
 - 2. Gypsum Board: 12 percent.
 - 3. Wood: 15 percent.
 - 4. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that 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. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete, precast concrete and Concrete Masonry (CMU) Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale. Clean interior steel using methods recommended in writing by paint manufacturer. Blast clean exterior steel according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- H. 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.

3.03 APPLICATION

- A. Apply paints and high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Coat 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. Coat front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- 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.
- E. Painting Fire Suppression, Plumbing, Mechanical, Communication, and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - 1. Mechanical Work:
 - a. Tanks that do not have factory-applied final finishes.
 - b. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - c. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 - d. Sprinkler piping.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. In exposed areas only, prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with a prefinished coating.
 - b. Uninsulated metal piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Other items as directed by Architect.

3.04 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.

3.05 PRODUCTS (ARCHITECT TO PROVIDE A PAINT PLAN DURING CONSTRUCTION)

3.06 INTERIOR PAINTING SCHEDULE –

- A. Gypsum Board Ceilings
 - 1. Primer: ProMar® 200 Zero VOC Latex Primer, B28W2600
 - 2. 1st coat: ProMar® 200 Zero VOC Interior Latex
 - 3. 2nd coat: ProMar® 200 Zero VOC Interior Latex

- B. Gypsum Board Walls – Unless Otherwise Noted
 - 1. Primer: ProMar® 200 Zero VOC Latex Primer, B28W2600
 - 2. 1st coat: ProMar® 200 Zero VOC Interior Latex
 - 3. 2nd coat: ProMar® 200 Zero VOC Interior Latex
- C. Concrete & Masonry
 - 1. Primer: Loxon® Concrete & Masonry Primer Sealer, A24W8300
 - 2. 1st coat: ProMar® 200 Zero VOC Interior Latex
 - 3. 2nd coat: ProMar® 200 Zero VOC Interior Latex
- D. CMU – Concrete Masonry Units
 - 1. Primer: PrepRite® Block Filler, B25W25
 - 2. 1st coat: ProMar® 200 Zero VOC Interior Latex
 - 3. 2nd coat: ProMar® 200 Zero VOC Interior Latex
- E. Ferrous Metal — Interior Doors and Door Frames
 - 1. Primer: Pro Industrial Pro-Cryl Universal Primer over Factory Primer.
 - 2. 1st coat: Pro Industrial Acrylic
 - 3. 2nd coat: Pro Industrial Acrylic
- F. Interior Exposed Steel
 - 1. Architectural steel columns and beams shall be factory primed.
 - 2. On site additional priming basis of design provide:
 - a. Pro Industrial Pro-Cryl® Universal Primer
 - 3. Intermediate Coat: Pro Industrial Waterbased Acrolon 100 Waterbased Urethane
 - 4. Finish Coat: Pro Industrial Waterbased Acrolon 100 Waterbased Urethane.

3.07 EXTERIOR PAINTING SCHEDULE

- A. Exterior exposed steel and miscellaneous steel and ferrous metals exposed to view:
 - 1. Exposed steel columns, beams and miscellaneous steel fabrications shall be factory prepped and primed.
- B. Steel Substrates:
 - 1. Primer/Touch Up:
 - a. PPG PMC Amercoat 133 at 6.0 - 8.0 mils DFT.
 - b. International Interseal 670HS at 6.0 to 8.0 mils DFT.
 - c. Tnemec 27WB Typoxy at 6.0 - 8.0 mils DFT.
 - 2. Intermediate Coat:
 - a. PPG PMC Amercoat 133 at 6.0 - 8.0 mils DFT.
 - b. International Interseal 670HS at 6.0 to 8.0 mils DFT.
 - c. Tnemec 27WB Typoxy at 6.0 - 8.0 mils DFT.
 - 3. Field Applied finish coating:
 - a. PPG PMC Amerlock 400 at 3.0 - 4.0 mils DFT.
 - b. International Interseal 670HS at 6.0 to 8.0 mils DFT.
 - c. Tnemec 115 Uni-Bond DF applied at 3.0 - 4.0 mils DFT.

END OF SECTION

SECTION 102239
FOLDING PANEL PARTITIONS

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. Electrically operated, continuously hinged partitions.
 - 2. Manually operated, individual panel operable partitions.
 - 3. Ceiling track and operating hardware.
- B. Related Requirements:
 - 1. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
 - 2. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.
 - 3. Section 092900 "Gypsum Board" for sound barrier construction above the ceiling at track.
 - 4. Division 27 Sections for electrical and controller connections.

1.03 DEFINITIONS

- A. NIC: Noise Isolation Class.
- B. NRC: Noise Reduction Coefficient.
- C. STC: Sound Transmission Class.

1.04 PREINSTALLATION MEETINGS

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

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable panel partitions.
 - 1. Include plans, elevations, sections, attachment details, and numbered panel installation sequence.
 - 2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
- C. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
 - 1. Textile Facing Material: Full width by not less than 36-inch- long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
 - 2. Panel Edge Material: Not less than 3 inches long.

1.06 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Partition track, track supports and bracing, switches, turning space, and storage layout.
 - 2. Suspended ceiling components.
 - 3. Structural members to which suspension systems will be attached.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. HVAC ductwork, outlets, and inlets.
 - c. Speakers.

- d. Sprinklers.
 - e. Access panels.
- 6. Plenum acoustical barriers.
- B. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.
- C. Sample Warranty: For manufacturer's special warranty.

1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, track switches, carriers, and other operating components.

1.08 MAINTENANCE MATERIAL SUBMITTALS

- A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data", including the following:
 - 1. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - 2. Seals, hardware, track, carriers, and other operating components.

1.09 QUALITY ASSURANCE

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

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.11 WARRANTY

- A. Special Warranty: Provide written warranty by manufacturer of operable partitions agreeing to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of operable panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion on materials.
 - 3. Warranty Period: Two (2) years from date of Substantial Completion on workmanship.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E90, determined by ASTM E413, and rated for not less than the STC indicated.
 - 2. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance according to ASTM C423, and rated for not less than the NRC indicated.

3. Noise-Isolation Requirements: Installed operable panel partition assembly, identical to partition tested for STC, tested for NIC according to ASTM E336, determined by ASTM E413, and rated for 10 dB less than STC value indicated.
- B. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- C. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

2.02 OPERABLE ACOUSTICAL PANELS

- A. Operable Acoustical Panels: Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 1. Manufacturers: Subject to compliance with requirements, provide as follows:
 - a. Basis of Design:
 - 1) Type 1: Modernfold Acousti-Seal Encore Automated - #14 and #30 Track Systems, electrically operated, continuously hinged operable partition. Where indicated on the Drawings.
 - 2) Type 2: Modernfold Acousti-Seal Encore Single Panel System. Where indicated on the Drawings.
 - b. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hufcor, 640 Series.
 - 2) Advanced Equipment Corporation.
 - B. Panel Operation:
 1. Type 1: Automated: Series of continuously hinged flat panels, electrically operated, top supported with operable floor seals and automatic top seals.
 2. Type 2: Single Panel: Series of individual flat panels, manually operated, top supported with operable floor seals and automatic top seals.
 - C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
 1. Nominal 4-1/4-inch thick panels in manufacturer's standard 51-inch widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
 - D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
 1. Panel Width: Equal widths.
 - E. STC: Not less than 54 – 21-gauge steel.
 - F. NRC: Not less than 0.60.
 - G. Panel Weight:
 1. Type 1: 54 STC - 9.5 lbs./square foot.
 2. Type 2: 54 STC - 9.5 lbs./square foot.
 - H. Panel Thickness: Nominal dimension of 4 inches.
 - I. Panel Closure: Manufacturer's standard unless otherwise indicated.
 1. Initial Closure: Resilient, bulb-shaped acoustical seal.
 2. Final Closure: Constant-force, lever-operated mechanical closure expanding from panel edge to create a constant-pressure acoustical seal.

- J. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.
 - 1. Hinges: Provide full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge to mounting frame. Provide lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.

2.03 SEALS

- A. Vertical Interlocking Sound Seals between panels: Aluminum astragals, with tongue and groove configuration in each panel edge. Rigid plastic astragals are not acceptable.
- B. Description: Seals that produce operable panel partitions complying with performance requirements and the following:
 - 1. Manufacturer's standard seals unless otherwise indicated.
 - 2. Seals made from materials and in profiles that minimize sound leakage.
 - 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- C. Vertical Seals: Deep-nesting, interlocking steel astragals mounted on each edge of panel, with continuous, resilient acoustical seal.
- D. Horizontal Top Seals: Continuous-contact, resilient seal exerting uniform constant pressure on track. Manually operated top seals are not permitted.
- E. Horizontal Bottom Seals:
 - 1. Manufacturer's standard continuous-contact seal exerting uniform constant pressure on floor.
 - 2. Mechanically Operated for Acoustical Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than 2 inches between retracted seal and floor finish.
 - 3. Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds downward force to the floor throughout operating range.

2.04 OPERATION AND MOTOR

- A. General: Each partition noted as electrically operated shall be operated by two push button control stations wired in series and located on opposite sides of the partition.
 - 1. Control stations shall be activated by key switch at stack end of partition.
 - 2. Motor unit shall be 208V, 3-phase, reversible, continuous duty, and Class A insulated.
 - 3. Motor service factor: Provide NEMA MG1.
 - 4. Motor characteristics: Provide high starting torque, thermal overload protection and open/drip proof enclosure.
 - 5. Motor writing: Compliant with NFPA 70.
 - 6. Motor Controls: Provide 24 volt, compliant with UL508A.
 - 7. Motor speed: Provide 28 feet/minute.
 - 8. The drive unit motor shall be equipped with outboard limit switches to prevent over-extension. A positive-chain drive attached to the lead panel shall pull the partition across the opening. Cable, belt or other friction type drives are not acceptable.

2.05 PANEL FINISH FACINGS

- A. Description: Finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
 - 1. Apply one-piece, seamless facings free of air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with invisible seams complying with Shop Drawings for location, and with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.

2. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
 3. Match facing pattern 72 inches above finished floor.
 4. Panel finish shall be factory applied, Class "A" rated material.
- B. Panel Finish: Provide wall covering finish on all panels.
1. Manufacturer: Wolf Gordon.
 2. Material: Vinyl.
 3. Style: BL50010CL
 4. Color: To be selected from manufacturer's full range of colors. There are two separate walls and each wall assembly may be a different color.
- C. Paint: Manufacturer's standard factory- painted finish.
1. Color: As selected by Architect from manufacturer's full range.
- D. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing, finished as follows:
1. Steel, Painted: Finished with manufacturer's color as selected by Architect from manufacturer's full range.

2.06 SUSPENSION SYSTEMS

- A. Tracks: **Tracks shall be all Steel construction**; min 7-gauge, 0.18-inch roll formed steel with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Track shall be supported by adjustable steel hanger brackets connected to primary structural support by pairs of 1/2" minimum threaded steel rods Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
1. Panel Guide: Steel guide integral to the track to facilitate straightening of the panels; finished with factory-applied, pre-painted finish.
 2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.
- B. Carriers: Two all-steel trolleys with steel-tired ball bearing wheels. Non-steel tires are not acceptable. Suspension system shall provide automatic indexing of panels into stack area using preprogrammed switches and trolleys without electrical, pneumatic, or mechanical activation.
- C. Track Intersections, Switches, and Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
1. Curve-and-Diverter Switches: Allow radius turns to divert panels to an auxiliary track.
 2. L Intersections: Allow panels to change 90 degrees in direction of travel.
- D. Steel Finish: Manufacturer's standard, factory-applied, decorative finish, protective coating unless otherwise indicated.

2.07 ACCESSORIES

- A. Infrared Safety (motion detection) System (at motorized locations only):
1. Furnish and install sufficient infrared sensing devices, with the approved guards, to detect any personnel obstructions along the entire length of the path of the folding door (no more than seven (7) feet, no less than three (3) feet to both sides) during opening and closing modes.
 - a. Passive Infrared Detectors "OPTEX" model # SP-80 AM High Sensitivity (PIR) Device shall be capable of wall or ceiling surface mounting , self-contained, self-monitoring circuit operating on 12 VDC input power and have adjustable integral anti-masking features capable of automatic fail to safe condition function optics . Optics shall be focused to provide the narrowest detection corridor adjacent to the doors that assures

reliable detection. The operator control switches shall be positioned as close to the detection corridor as possible without causing the operator to cause an unintended detection/alarm. Each Long-Range PIR Detector shall provide a multiple individual zones of detection. A solid infrared barrier must be achieved and be free of voids between detection zones. PIR detectors which permit voids in the infrared barrier and do not provide 100% coverage are unacceptable.

- 1) At (2) pocket / stack locations provide additional sensors.
- b. PIR guards shall be constructed of sheet metal with hi-temperature baked white enamel finish or an approved equal. Guard shall be independently fastened to the wall or ceiling with a least four approved fastening devices.
- c. Lockable System Control Panel (SCP): Install a suitable size to house all the equipment required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- B. Install panels in numbered sequence indicated on Shop Drawings.
- C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.
- E. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals. Perform test and make adjustments before NIC testing.

3.03 ADJUSTING

- A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping.
- C. Verify that safety devices are properly functioning.

3.04 DEMONSTRATION

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

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide Current Edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers 2022.
- C. UL (DIR) - Online Certifications Directory Current Edition.

1.03 SUBMITTALS

- A. Product Data (Fire extinguishers): For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Data (Fire-protection cabinets): For each type of product.
 - 1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing semi recessed mounting method and relationships of box and trim to surrounding construction.
- C. Product Schedule: For fire extinguishers. Coordinate the final fire extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- D. Shop Drawings: For fire-protection cabinets.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- E. Warranty: Sample of special warranty.

1.04 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.
- B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- C. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.05 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. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
- B. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.
 - 1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the the following:

- a. Amerex Corporation.
 - b. Ansul; brand of Johnson Controls International plc, Building Solutions North America.
 - c. Babcock-Davis.
 - d. Badger Fire Protection; a Carrier company.
 - e. Kidde; Carrier Global Corporation.
 - f. Larsen's Manufacturing Company.
2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- C. Multipurpose Dry-Chemical Type in Steel Container UL-rated 3-A:40-B:C, 6-lb nominal capacity.
 1. Basis of Design: J. L. Industries "Cosmic" series.
- D. Fire Extinguisher Cabinets and Accessories:
 1. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Babcock-Davis.
 - b. Fire-End & Croker Corporation.
 - c. Guardian Fire Equipment, Inc.
 - d. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
 - e. Larsen's Manufacturing Company.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 1. Class: K type.
 2. Temperature range: Minus 20 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Construction: Non-fire rated.
- C. Cabinet Material: Stainless steel sheet.
 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Stainless steel sheet.
- F. Door Material: Stainless steel sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Clear float glass.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide manufacturer's standard hinge, permitting door to open 180 degrees.
- J. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet glazing.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
- K. Materials:
 1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.
 - a. Finish: ASTM A480/A480M No. 8 mirrorlike reflective, nondirectional polish.
 2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3mm thick.

2.04 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Miter corners and grind smooth.
 3. Provide factory-drilled mounting holes.
 4. Prepare doors and frames to receive locks.
 5. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2-inch thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames and grind smooth.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.05 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying designated finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in for hose valves, racks, and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
 - 1. Mounting Height: Top of fire extinguisher to be at 42 inches above finished floor.
- C. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinet Mounting Height: 42 inches above finished floor to top of fire extinguisher.
- D. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- E. Identification:
 - 1. Apply decals at locations indicated.
 - 2. Apply decals on field-painted fire-protection cabinets after painting is complete.

3.04 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 115213
PROJECTION SCREENS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Electrically operated, front projection screen assemblies.
- B. Related Requirements:
 - 1. Section 055000 - Metal Fabrications: Supports for metal support framing for front-projection screens.
 - 2. Section 061000 - Rough Carpentry: Wood backing for screen installation.
 - 3. Division 26 Sections for electrical service and connections including device boxes for switches and conduits, where required, for low-voltage control wiring.

1.02 DEFINITIONS

- A. ALR: Ambient-light rejection; for specular reflective viewing surfaces, measured as the percentage of ambient light striking the viewing surface that has equal angles of incidence and reflection.
- B. Gain: Ratio of light reflected from viewing-surface material to that reflected perpendicularly from a magnesium carbonate surface as determined in accordance with SMPTE RP 94.
- C. Half-Gain Angle: The angle, measured from the axis of the viewing surface to the most central position on a perpendicular plane through the horizontal centerline of the viewing surface, where the gain is half of the peak gain.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
 - 1. Drop heights.
 - 2. Location of seams in viewing surfaces.
 - 3. For end-mounted motors, location of screen centerline relative to ends of screen case.
 - 4. Anchorage details, including connection to supporting structure for suspended units.
 - 5. Details of juncture of screen case or trim with adjacent finishes.
 - 6. For electrically operated units, wiring diagrams and location of wiring connections.
 - 7. Accessories.
- C. Product Schedule: For front-projection screens.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For front-projection screens to include in maintenance manuals.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver front-projection screens until spaces are enclosed and weathertight, wet-work in installation spaces is complete and dry, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions planned for building occupants during the remainder of the construction period.
- B. Store front-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.06 COORDINATION

- A. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC system components, and partitions.

PART 2 PRODUCTS

2.01 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

- A. General Requirements: Manufacturer's standard units, consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by Underwriters Laboratories Inc. (UL) or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. 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.
 - 2. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a metal rod, with ends of rod protected by plastic caps.
- B. Controls: Remote, key-operated, three-position control switch installed in recessed device box with flush cover plate.
 - 1. Provide one control switch for each screen location.
 - 2. Provide locking cover plate for each switch.
 - 3. Provide radio-frequency remote control consisting of battery-powered transmitter and receiver for each location.
- C. Suspended, Metal-Encased, Electrically Operated Screen with Automatic Ceiling Closure: Motor-in-roller unit with screen case fabricated from formed-steel sheet or from aluminum extrusions with manufacturer's standard finish and matching end caps.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Da-lite (Basis of Design).
 - b. Draper, Inc.
 - c. Stewart Filmscreen Corporation.
- D. Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 - 1. Unit shall have two motors, one to operate door and one to operate screen.
 - 2. Provide "quiet" operating motor option.
 - 3. Suspended-Mounting Configuration: Mounted using manufacturer's standard suspended connections to building structure as required.
 - 4. Screen-Case Color: As selected by Architect from manufacturer's standard options.
- E. Tab-Tensioned, Gain-White Viewing Surface: Minimum peak gain of not less than 0.9 and gain not less than 0.8 at an angle of 50 degrees from the axis of the screen surface. Provide viewing surface with black backing and without seams.
 - 1. Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.
 - 2. Viewing Surface: Da-Mat.
 - a. Material: Fiberglass.
 - b. Size of Viewing Surface:
 - 1) SCREEN 1: Viewing area size 111 inches high by 198 inches wide (227 inches diagonal) based on a 16:9 format.
 - 2) SCREEN 2: Viewing area size 94 inches high by 168 inches wide (193 inches diagonal) based on a 16:9 format. (Total of 3)
 - c. Extra Drop Height: 18 inches at the bottom of the screen.
 - 1) Color: Black.
 - d. Seamless Construction: Provide screens, in sizes indicated, without seams.
 - e. Flame Resistance: Passes NFPA 701.

- f. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor them to supporting substrate in a manner that produces a smoothly operating screen that, when lowered, has flat viewing surface and plumb vertical edges.
 - 1. Install low-voltage controls in accordance with NFPA 70 and complying with manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway, except in accessible ceiling spaces and in gypsum board partitions, where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables, except in unfinished spaces.
 - 2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.
 - 3. Test manually operated units to verify that screen-operating components are in optimum functioning condition.

END OF SECTION

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Motor-operated, double-roller shades.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
 - 2. Section 095113 "Acoustic Panel Ceilings" for coordination with shade housing installation within or adjacent to ceiling grid.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
 - a. Motorized Shade Operators: Include operating instructions.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
 - a. Clutch Roller Shade Operators.
 - b. Clutch roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members and attachment to building structure.
 - 2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - 3. Shade mounting assembly and attachment.
 - 4. Size and location of access to shade operator and adjustable components.
 - 5. Minimum Drawing Scale: 1/8 inch = 1 foot.
- D. Schedule: For roller shades and include opening sizes and key to typical mounting details.
- E. Samples for Initial Selection: For each type and color of shadeband material.
 - 1. Include Samples of accessories involving color selection.
- F. Product Schedule: For roller shades.

1.03 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units total. Provide in sized to match most typical units installed.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

- A. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Obtain roller shades from single source from single manufacturer.

2.02 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Draper, Inc.
 - 2. Hunter Douglas, Inc.
 - 3. Lutron Electronics Co., Inc.
 - 4. MechoShade Systems, LLC.
 - 5. Springs Window Fashions; SWFcontract.
- B. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
 - 1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.
 - a. Electrical Characteristics: 110-V ac.
 - b. Maximum Total Shade Width: As required to operate roller shades indicated.
 - c. Maximum Shade Drop: As required to drop the shade to the window sill .
 - d. Maximum Weight Capacity: As required to operate roller shades indicated.
- D. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

- a. Individual/Group Control Station: Momentary-contact, three-position, button-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
 - b. Color: As selected by Architect from manufacturer's full range.
 2. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions.
 3. Operating Features:
 - a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
 - b. Capable of interface with future audiovisual control system, provided by owner and not in contract.
 - c. Override switch.
- E. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.
 1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
 2. Inside Roller:
 - a. Drive-End Location: Left side of interior face of shade.
 - b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 3. Outside Roller:
 - a. Drive-End Location: Right side of interior face of shade.
 - b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 4. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- F. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.
- G. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- H. Inside Shadebands:
 1. Shadeband Material: Light-filtering fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
- I. Outside Shadebands:
 1. Shadeband Material: Light-blocking fabric .
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - b. Color and Finish: As selected by Architect from manufacturer's full range.
- J. Installation Accessories:
 1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.
 - b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
 2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recesses or pockets and for snap-in attachment to wall clip without fasteners.
 - a. Closure-Panel Width: To match roller shade.
 3. Installation Accessories Color and Finish: As selected from manufacturer's full range.
- K. Location: At each window location.

2.03 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Basis-of-Design Product: Mermet, E Screen.
 - 2. Source: Roller shade manufacturer.
 - 3. Type: Woven fiberglass and vinyl
 - 4. Weave: Basketweave.
 - 5. Thickness: Not less than 0.20 inches.
 - 6. Weight: Not less than 12 oz/yd.
 - 7. Roll Width: Manufacturer's standard.
 - 8. Orientation on Shadeband: Up the bolt.
 - 9. Openness Factor: 3 percent.
 - 10. Color: As selected by Architect from manufacturer's full range.
- C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
 - 1. Basis-of-Design Product: Mermet, Flocke.
 - 2. Source: Roller shade manufacturer.
 - 3. Type: Fiberglass, acrylic and cotton flocked backing.
 - 4. Thickness: Not less than 0.20 inches .
 - 5. Weight: Not less than 11 oz/yd.
 - 6. Roll Width: Manufacturer's standard.
 - 7. Orientation on Shadeband: Up the bolt.
 - 8. Color: As selected by Architect from manufacturer's full range.

2.04 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
 - 2. Two units 12'-0" Wide x 8'-0" Tall – verify exact dimensions in the field.
 - 3. One unit: 9'-0" wide x 8'-0" tall – verify exact dimensions in the field.
 - 4. One unit: 4'-0" wide x 7'-4" tall – verify exact dimensions in the field.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 - 1. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.
- C. Roller Shade Locations: At all exterior window locations.

3.03 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

3.06 ROLLER SHADE SCHEDULE

- A. General: Provide interior roller shades to comply with requirements in this Section and with the following schedule of shades.
 - 1. RS-1: Dual motorized shade, 3% open solar fabric and blackout shade, mounted to underside of header. Provide at each window location.

END OF SECTION

SECTION 230100
MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This Section forms a part of all Division 23 Sections.

1.02 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- A. Latest effective publications of following Specifications, regulations, standards, codes, etc., as applicable, form a part of these Specifications the same as if written fully herein and shall be followed as minimum requirements.

Codes and ordinances of local governing agencies:

AHRI	Air Conditioning, Heating and Refrigeration Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute
ASHRAE	American Society of Heating, Refrigerating and Air-conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
IEEE	Institute of Electrical and Electronics Engineers
VMC	Virginia Mechanical Code, 2021 Edition
NEC	National Electrical Code (NFPA 70), 2020 Edition
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air-conditioning Contractors National Association
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters Laboratories, Inc.
VUSBC	Virginia Uniform Statewide Building Code, 2021 Edition

1.03 DRAWINGS

- A. General arrangements of indicated piping, ductwork and equipment are diagrammatic only, do not scale. Where rearrangement is necessary, submit drawings of proposed changes for approval. Due to scale of drawings, offsets, fittings and accessories may not be indicated. Work indicated, but having details omitted, shall be provided complete to perform function intended without extra cost. Investigate existing structural and finish conditions in building affecting heating, ventilating and air-conditioning work, etc., and arrange work accordingly. Furnish fittings, traps, offsets, valves and accessories required. Install equipment in accordance with manufacturer's recommendations and clearance requirements.

1.04 COORDINATION

- A. Coordinate piping, ducts and equipment with electrical, structural, and architectural plans and work in order to avoid omissions and to eliminate any interference. Report in writing discrepancies, if found, to the Engineer as soon as possible after discovery.

1.05 WORKMANSHIP

- A. Workmanship shall be first class and of best quality in accordance with approved contemporary construction practices. Defective equipment and materials, or material damaged in the course of installation and tests shall be replaced or repaired in an approved manner.

1.06 CUTTING

- A. Cutting shall be carefully done. Repair damage to the building, piping, wiring, or equipment as a result of cutting for installation, using skilled mechanics of trade involved.

1.07 APPROVAL OF MATERIALS AND EQUIPMENT

- A. See Specification Section 013300 "Submittal Procedures", for shop drawing submittal procedures. Within 30 days after award of the Contract and before any purchases are made, submit for approval a complete list of materials and equipment proposed, together with names of manufacturers and catalog numbers for each Specification Section. Furnish other detailed information where directed. No consideration will be given to partial lists submitted from time to time. Approval of materials shall be based on manufacturer's published ratings. Materials and equipment listed which are not in accordance with specified requirements shall be rejected. Contractor shall make resubmission of items not approved within 30 days from date of rejections. Submission shall be complete with description, ratings, dimensions and related items and any additional information required by the Engineer.
- B. Materials and equipment shall be new, conforming to these Specifications.
- C. Two or more units of same class of equipment shall be product of single manufacturer; however, component parts of system need not be product of same manufacturer.
- D. Mechanical design has given full consideration to space requirements for equipment specified. Contractor is responsible for selecting equipment that will be accommodated by this space. Equipment not conforming to space allotted shall be rejected.
- E. Mechanical design has given full consideration for electrical requirements for equipment. Contractor is responsible for selecting equipment that will be accommodated by the electrical design indicated. Equipment not conforming to the electrical design provided under Division 26 is the Contractor's responsibility. All electrical changes required to accommodate the equipment provided shall be furnished and installed by the Contractor without change in Contract price or time of completion. This shall include but not be limited to wiring, conduit, circuit breakers, disconnect switches, and controllers.
- F. Submit one copy of equipment installation manuals to the Engineer for their use.

1.08 EQUIPMENT DESIGN

- A. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASME, ANSI, IEEE, or other applicable technical standards, suitable for maximum working pressure and shall have neat and finished appearance.

1.09 SUPERVISION

- A. The Contractor for each Section under this Division shall maintain a competent foreman on the job at all times to supervise the work and coordinate with other trades for the installation of the system. Submit foreman's qualifications, including master's trade license, to the Engineer for approval.

1.10 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits and pay all required fees.

1.11 RECORD DRAWINGS

- A. Refer to Specification Section 017839 "Project Record Documents".

1.12 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Specification Section 017823 "Operation and Maintenance Data".

1.13 OWNER'S TRAINING

- A. Upon completion of work and at a time designated by the Owner, the services of competent persons shall be provided as required to instruct Owner's representative in operation and maintenance of systems. Training sessions shall be a combination of on-site and in-classroom training and shall be a minimum of one 8-hour session. All training shall be video recorded by the Contractor and provided to the Owner in electronic format.

1.14 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.
- B. Contractor shall service the systems for 12 months from date of Substantial Completion. Such service shall include all emergency services and adjustments, except cleaning/changing of filters. Adjustments and repairs to equipment shall be made by the original equipment manufacturer (OEM). Third party service agencies are not acceptable for making repairs or adjustments to equipment during the warranty period.
- C. The equipment manufacturer and Contractor shall provide a one-year material, labor and refrigerant warranty on all compressors. In addition, the manufacturer shall provide a material only warranty on all compressors for a period of 5 years total, beginning at the date of Substantial Completion.
- D. Contractor shall be responsible for all maintenance, repair and servicing of mechanical equipment during the construction and warranty period as required by the equipment manufacturers and identified in the Operation and Maintenance Manuals. This shall include all routine maintenance, such as greasing of bearings, cleaning of coils, cleaning of strainers, calibration of controls and other routine maintenance items that may be unique to each piece of equipment. This shall also include repair and replacement of any malfunctioning or damaged parts. In addition, this shall include changing filters on a monthly basis through award of Substantial Completion and on a monthly basis during the warranty period. Where pre-filters and final filters are used in a system, the final filters shall only require replacement once, at the end of the warranty period, as long as the pre-filters have been changed as specified. Upon the Owner's observation that this work is not being performed by the Contractor, the Owner will arrange to have these services performed and shall deduct the associated costs from the contract amount or back charge the Contractor for services performed. Monthly service logs shall be forwarded by the Contractor to holders of the operation and maintenance manuals. Contractor shall respond within 24-hour notification by Owner or General Contract.

PART 2 - PRODUCTS

2.01 PIPE SLEEVES, PIPE HANGERS, PIPE SUPPORTS, DUCT SUPPORTS

- A. Provide pipe sleeves, hangers, supports and duct supports. Contractor shall be responsible for proper and permanent location. All piping passing through all walls shall be sleeved and insulation shall run continuously through sleeve. Install pipe sleeves and properly secure in place with grout where pipes pass through all walls and at all fire-rated assemblies. Pipe sleeves shall be sufficient diameter to provide approximately 1/4" clearance around insulation or pipe. Fill void between insulation or pipe and sleeve with mineral wool to prevent sound transmission.
- B. Hang horizontal overhead runs of pipe with adjustable clevis-type hangers spaced not over 10 feet apart. Provide hangers other than aforementioned, if pipe size or other features make spacing at shorter intervals necessary. Pipe hangers shall be provided within 4 feet of all changes in direction of pipe. Pipe hangers shall not be installed on pipe fittings where fitting could bear the weight of connected pipe but instead shall be installed on pipe at intervals previously specified. Chain, strap, perforated bar, or wire hanger will not be permitted. Hangers shall have short turnbuckles or approved means of adjustment. Hangers for copper tubing shall be copper plated where in contact with tubing. Hangers, including rods and clamps, shall be hot dipped galvanized exterior to the building. Hangers shall be zinc plated in all interior spaces, except as otherwise specified.
- C. Condensate piping on roof shall be supported by support blocks manufactured by ROOF TOP BLOX model RTB-01, or approved equal. The support blocks shall be designed to eliminate roof penetrations, flashings or damage to roofing membrane. Support body shall be made of recycled UV-resistant Polypropylene Copolymer. Base platform material shall be 1" thick, 25psi, type 4 closed cell structural foam to distribute and evenly cushion loads. Support top surface shall have molded in pipe organizing saddles and strut mounting cradle. The top surface shall also have screw guide indents and engineered internal screw thread gripping feature. Block shall accept up to 1/2" threaded rod using side entry nut slots to allow fast top side assembly and piping height adjustments or attachment of galvanized slotted steel strut channel. All support block hardware shall be hot dipped galvanized. For roof mounted piping, provide approved pipe supports every four feet for Polyvinyl Chloride (PVC).
- D. Supports for piping, ductwork and equipment shall be attached to a structural member, not bridging. Piping, ductwork and equipment shall not be attached to structural joist bridging or floor decking. Provide additional steel supports spanning between joists or beams for hanger attachments. Additional steel supports shall be approved by the Structural Engineer.
- E. In areas supported by steel beams, secure hanger rods directly to beams.
- F. Provide galvanized steel shields or protection saddles to protect insulation at area of contact with hangers and supports. Where shields are used on pipes 1-1/2" and larger, provide insulation inserts at points of hangers and supports. Refer to Specification Section 230700 "Mechanical Insulation", for details.
- G. Support and fasten equipment in an approved manner.
- H. Ductwork shall be supported in accordance with SMACNA, HVAC Duct Construction Standards, unless otherwise noted or indicated. Ductwork shall be supported using threaded rod or solid metal strap as required by SMACNA. No other materials, such as perforated metal strap, or cloth strap, are acceptable. Wire may be used to hang round duct smaller than 10"; however, solid metal strap shall be used to wrap around duct. Wire shall not be used for rectangular duct or round duct larger than 10".

2.02 DUCT AND PIPE PENETRATIONS THROUGH WALLS AND CEILINGS

- A. Fit exposed pipes passing through finished walls, or finished ceilings with escutcheon of chromium-plated cast-brass plates on chromium-plated pipe, nickel-plated steel plates on ferrous pipe, or copper tubing. Plates shall be large enough to completely close hole around pipes and conceal pipe sleeves and shall be round, with least dimension at least 1/2" larger than diameter of pipe and insulation. Secure plates in an approved manner.
- B. Fit ductwork passing through walls or ceilings with 22-gauge galvanized sheet-metal sleeves. Sleeves shall be large enough to completely close hole around duct and shall be at least 1/2" larger than outside dimensions of duct and insulation. Provide flanges on both sides of penetrations to cover the wall edge. For uncovered ducts, sleeves shall be of same material as duct. Secure sleeves and flanges in an approved manner.
- C. Through penetrations of fire rated partitions, firewalls, smoke partitions, or floors shall be sealed using an approved firestop system in accordance with ASTM E814 or UL1479. Firestop systems utilized shall be equal to or greater than the fire resistance rating of the penetrated partition. Applicable penetrations include but are not limited to: metallic pipe/conduit/tube, nonmetallic pipe/conduit/tube, cable/cable bundle, cable tray, electrical busway, ductwork, hydronic piping, and refrigerant piping. Basis of design for firestop systems shall be HILTI, or equal by STI or 3M.

2.03 ELECTRICAL WORK FOR EQUIPMENT UNDER MECHANICAL SYSTEMS

- A. All non-integrated motor controllers serving equipment installed under Division 23 Sections shall be furnished under those Sections and shall be turned over to Electrical Contractor, for installation by Electrical Contractor. Controllers shall be equipped with all auxiliary contacts, poles, or devices necessary to permit interlocking and control required.
- B. Fractional horsepower motors 1/2 HP and below shall be single-phase, 60 cycles, 120V; motors larger than 1/2 HP shall be 3-phase, 60 cycles, of voltages indicated on the electrical drawings and conforming to the electrical service, except where indicated otherwise. Motors shall conform to latest NEMA requirements.
- C. All electrical power wiring required for equipment installed under Division 23 Sections shall be provided under Division 26 Sections with all necessary approved wiring diagrams and guidance provided under Division 23 Sections, except for power wiring to Automatic Temperature Control panels which shall be provided by the Automatic Temperature Control Contractor.
- D. Raceways shall be 1/2" minimum. All wiring in rooms with exposed structure or in inaccessible ceiling and walls shall be installed in conduit. Label the front face of the cover on each junction box with indelible black marker indicating the number of each circuit contained in or running through the box. In areas where exposed construction is the final finished condition and conduit and junction boxes are called out to be painted, label the inside face of the covers.
- E. All control and power wiring required for temperature control system and all interlocking and accessory control wiring required for equipment installed under Division 23 Sections shall be installed by the Plumbing, Mechanical and Temperature Control Contractors.
- F. All controls shall be NEMA rated and NEMA I enclosed where mounted inside building. Controls mounted outside or where specifically called for shall be NEMA 3R.
- G. Auxiliary 120-Volt contacts shall be provided to give control and interlocking as required or as indicated.
- H. The Contractor shall be responsible for coordinating with the Division 26 Contractor for providing properly sized circuit breakers to serve equipment and motors furnished which differ from that specified or indicated. This shall be further understood to include branch circuit wiring, conduit,

disconnect switches, etc., in accordance with the appropriate codes and specifications. The cost of providing this increased electrical service and related work shall be included under the applicable section under which the equipment and motors are being furnished, at no additional cost to Owner.

- I. The Automatic Temperature Controls Contractor shall be responsible for providing circuit breakers and power wiring and conduit from electrical panels installed under Division 26 to Automatic Temperature Controls panels. All electrical work shall be in accordance with appropriate codes and Division 26 specifications.
- J. The Mechanical Contractor shall be responsible for the installation and mounting of all duct smoke detectors in new and existing ductwork. The duct smoke detector shall be furnished and provided with all fire alarm wiring under Division 28. Any and all Temperature Control wiring shall be provided under Division 23. Refer to the mechanical drawings for locations in new ductwork. Refer to the electrical drawings for locations of existing detectors to be replaced. Coordinate the installation of the detectors with the Electrical and Automatic Temperature Control Contractors.
- K. Short-Circuit Current Rating (SCCR) on HVAC equipment nameplates:
 - 1. The nameplate for all HVAC equipment shall be provided with SCCR in accordance with the National Electric Code (NEC) Article 440.4(B). The SCCR shall meet or exceed the SCCR indicated on the contract documents.
- L. The Mechanical Contractor shall coordinate the following electrical requirements with the Electrical Contractor prior to ordering any equipment:
 - 1. Number of electrical connections
 - 2. Number and size of feeder conductors
 - 3. Number and size of feeders' terminal lugs
 - 4. Maximum overcurrent protection
 - 5. Size and type of fuses

2.04 AIR BALANCING DEVICES

- A. Furnish any additional material or equipment, such as sheaves, belts, motors and balancing devices, required to complete and/or adjust and balance the systems as recommended by the TAB Agency at no additional cost to the Owner. Failure to provide additional means of adjusting and balancing will not relieve the Contractor of responsibility for properly adjusting and balancing the various systems as intended.

2.05 DUCT SEALANT

- A. Where duct is indicated to be sealed, utilize a fire resistive, water based, indoor/outdoor, U.V. resistant, non-fibrated duct sealant, DUCTMATE EverSeal, FOSTER DUCT-FAS 32-19 or approved equal.
- B. Sealant shall have a volatile organic compound (VOC) rating of 24 g/L, less water.
- C. Sealant shall meet all SMACNA pressure classes up to 10" w.g. and SMACNA seal classes A, B and C.
- D. Apply sealant with brush working sealant into all joints. Follow manufacturer's instructions for all application requirements.
- E. The use of duct sealing tape of any kind is unacceptable.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

- A. Pipe systems shall be complete. Pipe shall be of size indicated or, where not indicated, shall be of size required to produce capacities of the equipment specified.
- B. Install runs of piping as indicated. Cut pipe accurately to measurements established at the building by the Contractor and work into place without springing or forcing. Do not cut or move any structural portions of the building without approval. Run piping above ground, parallel with lines of buildings, unless otherwise shown or specified.
- C. Install piping to allow for expansion and contraction, using offsets, swing joints, expansion joints, anchors and related items as may be necessary. Make connections to coils and other equipment in such manner as to eliminate undue strains in piping and equipment and to prevent noise transmission. Provide necessary fittings and bends to avoid springing of pipes during assembly.
- D. Unless otherwise indicated, connections to equipment shall be as shown by manufacturer's data. Make piping connections to equipment with unions or flanged connections arranged so that equipment can be dismantled without disturbing the piping installation. Unions shall be accessible after building is complete. Provide valves to isolate equipment for service or removal.
- E. Run horizontal water piping with pitch of at least 1" in 40'-0" and arrange to drain to minimum number of low points. Equip low points with drain valves and hose nipples not smaller than 3/4". Eccentric reducing fittings or eccentric reducing couplings shall be installed where indicated or as required to bring bottoms of mains in line and prevent pockets. Pitch closed loop water piping to vent at high points.
- F. Close pipe openings with caps or plugs during installation. Cover equipment tightly and protect against dirt, water and chemical or mechanical injury. Carefully free interior of pipe of superfluous material as work progresses. Upon completion of work, thoroughly clean fixtures, materials and equipment and deliver in approved unblemished condition.
- G. Ream pipe after cutting and before threading and remove burrs. Make screwed joints with graphite and oil or approved graphite compound applied to threads only. Cut threads full and not more than three threads on pipe shall remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Provide unions where required for disconnection. Use swing joints for branch connections to risers and mains.
- H. Make copper tubing sweat joints with noncorrosive flux and lead-free solder recommended for service encountered or as indicated.
- I. All copper pipe joints shall be made with fittings. Formed bell & spigot couplings and mechanical "T" formed joints are not acceptable.

3.02 EQUIPMENT SUPPORTS AND FOUNDATIONS

- A. Design and construct supporting structures of strength to safely withstand stresses to which they may be subjected and to distribute properly the load and impact over building areas. Conform to applicable technical societies' standards, also to codes and regulations of agencies having jurisdiction. Obtain approval before fabrication.
- B. Fasten ceiling-hung equipment to building structures or inserts as approved.
- C. Provide adequate supports for roof-mounted mechanical equipment. Supports shall keep equipment clear of roof and transmit weight to roof structure as approved by Structural Engineer.

- D. The Contractor shall submit for review physical data for each unit supported from the building structure, either suspended from or attached to the building structure. The physical data shall include the equipment operating weight, corner weights, and center of gravity.

3.03 NOISE AND VIBRATION

- A. Mechanical and electrical equipment shall operate without objectionable noise or vibration as determined by the Owner.
- B. If such objectionable noise or vibration should be produced and transmitted to occupied portions of building by apparatus, piping, ducts, or other parts of mechanical and electrical work, make necessary changes and additions as approved, without extra cost to the Owner.
- C. Isolators shall prevent, as far as practicable, the transmission of vibration, noise, or hum to any part of building.
- D. Isolators shall suit vibration frequency to be absorbed. Provide isolator units of area and distribution to obtain proper resiliency under load and impact.

3.04 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Responsibility for care and protection of mechanical equipment rests with Contractor until Substantial Completion of the work.
- B. After delivery, before and after installation, protect equipment and materials against theft, injury, the environment, or damages from all causes.
- C. Protect equipment outlets and pipe openings with temporary plugs or caps.
- D. During construction, seal off all openings into interior of equipment and ductwork with sheet metal or taped polyethylene sheathing to prevent infiltration of dust.
- E. Temporary (MERV 8) filters shall be provided a minimum of every 14 days for all fans that are operated during construction and new (MERV 8) filters shall be installed after all construction dirt has been removed from the building just prior to testing and balancing. Following the testing and balancing, (MERV 8) filters shall be provided a minimum of every 14 days for all fans that are operated during construction. Just prior to Final Completion, all filters shall be replaced with the final filters, with MERV ratings as indicated in the equipment schedules and specifications. Ducts shall be inspected for dust and dirt. Contractor shall provide a signed statement to indicate that new filters for each piece of equipment were installed just before Final Completion. Construction filters shall be removed and not be used as the final set of filters. The contractor shall keep a filter replacement log that includes equipment identifications and dates of filter installation. Log shall be provided to the Engineer and Owner for review on a monthly cycle. Should the Contractor fail to comply with the filter changes as specified, the Owner may, at his discretion, hire through a separate contract the specified filter changes and withhold the cost for this work from the construction contract amount as a back charge to the Contractor.
- F. Provide a spare filter (or sets of filters for equipment that require multiples) for each piece of equipment. Turn filters over to Owner with proper transmittal prior to Final Completion.
- G. Equipment not designed for exterior installation (i.e., Series fan-powered VAV boxes, etc.) shall not be delivered to the job site until a location protected from the environment is provided. Location shall be approved by the Architect and Engineer prior to delivery.

- H. Equipment suitable for exterior installation (i.e., packaged rooftop unit, etc.) shall not be delivered to the job site until it is ready to be installed in its permanent location.

3.05 CONTRACTOR'S RESPONSIBILITY FOR MANUFACTURER'S AUTHORIZED FIELD START-UP

- A. The equipment manufacturer shall furnish a factory-trained and certified service technician without additional charge to start the HVAC equipment. This individual's certifications shall be submitted as a shop drawing along with the equipment and shall be reviewed and approved by the Engineer. Unit manufacturers shall maintain service capabilities no more than 100 miles from the job site.
- B. The HVAC equipment to be started by the manufacturer's certified technician shall include:
 - 1. Packaged rooftop air conditioning units
 - 2. Series Fan-powered VAV Boxes
- C. The manufacturer shall furnish complete submittal wiring diagrams of the HVAC equipment as applicable for field maintenance and service.
- D. Start-up sheets on all equipment shall be submitted and reviewed by the engineer. An approved copy shall be included in the final TAB report. If required, this same representative shall be made available to review the startup sheets onsite with the Engineer and Owner.

3.06 CONTRACTOR'S RESPONSIBILITY FOR TESTING, ADJUSTING AND BALANCING (TAB)

- A. Provide the TAB Agency a full set of Contract Documents (drawings and technical specifications), all manufacturers' approved submittal data and copies of revised data as soon as possible.
- B. Ensure that a current TAB Engineer's certification certificate is kept on file.
- C. Ensure all systems have been installed and are in 100% working order before the TAB Engineer is called to the job site, including but not limited to ductwork, piping, terminals, electrical and ATC. The Contractor shall verify that each item of the Pre-TAB Checklist (see Appendix A) has been completed and shall deliver a signed copy of the Pre-TAB Checklist to the Owner's Representative and the TAB Agency attesting that the project is complete and ready for TAB work to begin.
- D. Ensure that all ductwork requiring SMACNA – ADLTM duct leakage testing has been tested in the presence of the TAB Engineer and Owner's Representative and has met the referenced requirements.
- E. Provide adequate access to all points of measurement and adjustment and ensure that all dampers operate freely.
- F. Provide a factory representative for all major pieces of equipment as requested by the TAB Agency to assist in operation and performance verification of equipment.
- G. Cooperate with the TAB Agency to help operate and adjust the control systems directly related to TAB work and provide any specialties required to make such adjustments.
- H. Carefully review the drawings and Specifications for the various systems noting all facilities incorporated in the design for purposes of adjusting and balancing. Should it be deemed necessary to provide additional dampers, baffles, valves, or other devices which would aid in the required adjusting and balancing, same shall be provided by the installing contractor.

3.07 EQUIPMENT COORDINATION

- A. The Prime contractor shall conduct an HVAC Coordination meeting after submission of the HVAC equipment, fire alarm, and controls submittals to the Engineer, and prior to the return of the reviewed controls submittal to the Prime Contractor. The Prime Contractor shall coordinate the meeting time, date, and location with all parties, provide a written agenda, provide written meeting minutes, and provide a detailed issues summary (if unresolved issues remain open after the meeting).
- B. The Prime Contractor shall provide follow-up action as required with the following in mandatory attendance:
 - 1. Prime Contractor Project Manager and Project Superintendent
 - 2. Equipment manufacturer technical services representative (not a sales representative)
 - 3. Controls contractor technical services representative (not a sales representative)
 - 4. Mechanical engineer
 - 5. Owner's representative
 - 6. Fire alarm system representative
- C. The purpose of this meeting is to review equipment, control sequences, and the selected manufacturer's available control points. Upon completion of this meeting, the General Contractor shall be required to submit a meeting report detailing all discussed issues and coordinated solutions. Any unresolved issues shall require another mandatory meeting to ensure all items have been considered and coordinated prior to construction.

3.08 CLEANING, PAINTING AND IDENTIFICATION

- A. Remove from site excess material, equipment protection, etc. Thoroughly clean piping, hangers, equipment, and leave every part in perfect condition ready for use, painting, or insulation as required.
- B. Paint exterior surfaces of equipment supports and other ferrous metal work, except that which is galvanized, with one coat of RUSTOLEUM damp-proof red primer, or approved equal.
- C. Provide color-coded identification dots affixed to the ceiling grid for equipment, access doors, terminal equipment controllers, smoke detectors, filters and valves concealed above ceilings. Provide a color-coded chart identifying type of equipment or valve. Chart shall be framed and mounted, under clear plastic and located as directed by Owner.

3.09 EQUIPMENT MARKING

- A. Label all mechanical equipment, including starters, control panels, VAV boxes, pumps, rooftop units, temperature sensors and humidity sensors.
- B. Labels on panels and equipment shall be machine engraved, laminated, 1/8" thick, Bakelite, nameplate type.
- C. Labels shall have 1/4" high letters.
- D. Labels shall be rigidly attached using rivets or screws. Adhesive backing is not acceptable.
- E. Sensor labels shall be a self-adhesive type label. Labels shall identify the equipment served by the sensor.

APPENDIX A

PRE-TAB CHECKLIST

A. GENERAL

1. All components of the HVAC system have been installed, including controls and control wiring.
2. Power wiring has been installed and energized to all motorized equipment. Also, all line voltage control wiring required has been installed.
3. All equipment has been started and run tested through all specified sequences of operation by factory-authorized representatives and all safety controls have been verified to be operational.
4. All required testing of piping and duct systems has been completed in accordance with the drawings and specifications.
5. Duct leakage testing, where required, shall be witnessed by the Owner's Representative and/or the TAB Agency.

B. HVAC WATER DISTRIBUTION SYSTEMS

1. All air has been vented from the hydronic piping systems, equipment and coils.
2. All control valves are installed and functioning properly according to the specified sequences of operation.
3. All required pressure, temperature and flow measuring devices and balancing valves have been installed. All taps and adjustment dials are accessible and adequate clearances have been provided for connection of instrument hoses and adjustment taps, dials and scales are free of paint, insulation mastic and other foreign matter.

C. AIR DISTRIBUTION AND VENTILATION SYSTEMS

1. All air system filters have been replaced with new filters. The air moving equipment, ductwork and air terminals are installed and connected. All air systems are unobstructed and free of debris.
2. All manual volume control dampers required are installed and properly connected to adjustment handles. All damper handles are accessible and not covered by insulation or draw bands. All automatic dampers required have been installed with linkages connected and adjusted to provide the specified sequence of operation.
3. Access doors have been installed where required to allow inspection and servicing of duct-mounted dampers, equipment and components.
4. All ductwork and connections of duct to air terminals have been checked and no visible or audible leakage exists.
5. Fans are rotating in correct direction. Fans have been lubricated. Drive pulleys are aligned and belt tension is correct. Setscrews are tight securing keys into key-ways. Fan wheels turn freely and are balanced. Belt guards are in place.
6. Vibration isolators and flexible connectors have been installed where required. With fans in operation, there is no excessive vibration of fan assemblies or ductwork.

I, _____ an authorized representative of
(Signature and Title)

(Company)

attest that all items contained in the above Pre-Tab Checklist have been completed

and verified as of this date: _____.

APPENDIX B

Equipment Inventory Template

Project Name: **(Add Project Name)**

Project Address: **(Add Project Address)**

Description of Item: _____
(i.e., Air Handling Unit, Ductless Split System, etc.)

Classification:

- ☐ HVAC
- ☐ Plumbing
- ☐ Fire Protection

Building: _____

Equipment Location (Room Number): _____

Date Purchased: _____

Date Placed in Service: _____

Original Cost: _____

Life Expectancy (years): _____

Estimated Replacement Date: _____

Estimated Replacement Cost: _____

Manufacturer: _____

Model/Serial #: _____

END OF SECTION

SECTION 230500
HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.
- B. Refer to Specification Sections 230900 "Automatic Temperature Controls" and the Control Diagrams on the Contract Drawings for additional requirements and coordination between equipment and controls.

1.02 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of material and workmanship for a period of 12 months from date of Substantial Completion of the building. Refer to Section 230100 for additional warranty period responsibilities.

1.03 SUBMITTALS

- A. Submit manufacturer's performance data and unit details on all products specified below or indicated on Contract Drawings.

1.04 PROTECTION OF EQUIPMENT AND MATERIAL

- A. All equipment and material not specifically designed for exterior installation shall not be delivered to the job site until an indoor, dry location is available for storage. All equipment and material shall be covered and protected from dirt, debris, moisture, paint, coatings, and damage of any kind. Store off the floor, in a location approved by the Owner, to prevent contact with water.

PART 2 - PRODUCTS

2.01 HEAT GENERATION (NOT USED)

2.02 REFRIGERATION (NOT USED)

2.03 AIR HANDLING EQUIPMENT

- A. Transfer Exhaust Fan (TF-1):
 - 1. Ceiling fans shall be constructed of galvanized steel, with forward curved direct-drive centrifugal fans. Provide factory-wired plug-type disconnect, gravity back-draft damper, and ceiling grille. Provide ceiling grille where indicated.
- B. Packaged Air Conditioning Unit (RTU-1)
 - 1. Packaged air conditioning units shall be accordance with the following specifications and capacities as shown on the plans. Provide unit manufactured by TRANE: Horizon - Model OA or approved equal.

2. Packaged rooftop unit shall include compressors, coils, filters, supply fans, exhaust fans, dampers, air-cooled condenser coils, condenser fans, reheat coil and unit controls.
3. Unit shall be specifically designed for outdoor applications and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-454B refrigerant and oil.
4. Unit shall be factory run tested prior to shipment. Factory test shall include refrigeration circuit run test, unit control system operations checkout, refrigerant leak test and final unit inspection.
5. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
6. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
7. Installation, Operation, and Maintenance manual shall be supplied within the unit.
8. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
9. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.
10. General:
 - a. The supply and return openings shall be horizontal airflow. Cooling performance shall be rated in accordance with ETL testing procedures. All units shall be factory assembled, internally wired, fully charged with R-454B, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be ETL listed and labeled, classified in accordance with UL 1995/CAN/CSA No. 236-M40 for Central Cooling Air Conditioners.
 - b. Casing
 - 1) Unit casing shall be constructed of zinc-coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested at a minimum of 672 hours in a salt spray test in compliance with ASTM B117. Unit shall have a 2-inch thick Antimicrobial Insulation. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up. The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top.
 - c. Drain Pan
 - 1) The drain pan shall be a single-walled assembly made of Type 304 stainless steel. It shall be sloped in two planes and is fully drainable. The coils shall be mounted above the drain pan to allow easy inspection and cleaning of the drain pan.
 - d. Supply and Exhaust Fans and Motors
 - 1) Fan motor shall be direct drive type with factory installed Variable Frequency Drive. All motors shall be thermally protected. All indoor fan motors meet the U.S. Energy Policy Act of 2005 (EPACT). Fan shall be a high efficiency backward curved impeller.

- e. Condenser Fan
 - 1) Condenser fans shall be controlled via VFD to maintain adjustable pressure to increase reheat capacity where applicable and low ambient control.
 - 2) Provide with condenser hail guards.
- f. Dampers – Low Leak
 - 1) The outside air damper shall have a unit-controlled actuator with parallel-blades. The blade construction shall be 14-gage galvanized steel, roll-formed airfoil-type.
- g. Return Air
 - 1) Dampers shall be low-leak. Each damper shall have a unit-controlled actuator. Inputs shall be provided for unoccupied economizer control, based upon a comparison of the outside air stream to a dry bulb reference point an information-only diagnostic message on the human interface and will allow continued unit operation.
- h. Filters
 - 1) 2-inch MERV-8 filters shall be installed just upstream of the evaporator coil. In addition, 2-inch aluminum mesh mist eliminators shall be located in the intake hood.
 - 2) A Filter Status switch shall indicate when filters require cleaning or replacement.
- i. Sensors
 - 1) A factory installed combination outdoor air sensor located in the outdoor air hood is designed to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions.
- j. Compressors
 - 1) Unit shall have direct-drive, hermetic, digital scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors. Crankcase heaters shall be included. Compressor shall be able to fully modulate from 20 percent to 100 percent.
- k. Evaporator and Condensing Coils
 - 1) Internally finned copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 500 psig and pressure tested to 500 psig. The condenser coil shall have a

fin design with slight gaps for ease of cleaning. Evaporator coil will have six interlaced rows for superior sensible and latent cooling.

I. Hot Water Heating:

- 1) The hot water coil shall be ARI performance certified and shall bear the ARI symbol. Tubes are to be mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials shall be 5/8" diameter x (0.020) wall thickness. Secondary surface (fins) shall be of the plate-fin design using aluminum with die-formed collars. Fin design shall be waffle in a staggered tube pattern to meet performance requirements. Collars shall hold fin spacing at specified density, and cover the entire tube surface. Fins shall be free of oils and oxidation. The coil shall have MPT connections constructed of copper. Water valves are field supplied and installed.

m. Controls

- 1) Unit is completely factory-wired with necessary controls and contactor pressure lugs for power wiring. Units have a Multi Zone VAV control device with a display. Microprocessor controls are provided for all 24-volt control functions. The resident control algorithms will make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring outdoor temperature and humidity. The control algorithm maintains accurate temperature control, minimizes drift from set point, and provides better building comfort. A centralized micro-processor (UC600) will provide anti-short cycle timing for a higher level of machine protection. Terminals are provided for a field installed dry contact or switch closure to put the unit in the Occupied or Unoccupied modes. A factory provided static pressure sensor will be shipped with the unit for installation inside the supply ductwork.

- n. Short Circuit Withstand Rating of the unit electrical enclosure shall be 65,000 Amps. Rating shall be published in accordance with UL508.

o. Roof Curbs

- 1) Provide factory supplied roof curb, heavy gauge zinc coated steel with supply and return air gasketing. Ship knocked down, and provide instructions for easy assembly.
- 2) Curb shall be manufactured in accordance with the National Roofing Contractors Association guidelines for rooftop equipment support.

p. Warranty

- 1) Refer to Specification section 230100 for additional warranty information.

2.04 UNITARY EQUIPMENT (NOT USED)

2.05 TERMINAL EQUIPMENT (NOT USED)

2.06 HVAC PIPING AND SPECIALTIES

A. Piping

1. Water and HVAC drain piping shall be provided as specified below. Where options of different materials are given for the same service, contractor shall select materials and use them uniformly throughout the system. Contractor shall submit experience with all of the materials and joining methods specified.
2. Hot Water piping:
 - a. Above ground
 - 1) Type L copper (2" and under)
 - 2) Schedule 40 threaded black steel (2" and under)
3. Condensate drain piping
 - a. On rooftop and exterior to building
 - 1) Schedule 40 PVC
4. Type L copper pipe shall conform to ASTM B42 and be assembled with wrought-copper soldering fittings using 95-5 solder or with press fittings as specified herein.
5. Schedule 40 PVC pipe shall be assembled in strict accordance with manufacturer's instructions. Solvent cement shall conform to ASTM D2564.
6. Press Fittings:
 - a. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and NSF/ANSI Standard (NSF 61). Sealing elements for press fittings shall be factory installed EPDM.
 - b. Press fittings 1/2" – 2" press end shall have a leak-before-press feature, which assures leakage from inside the system past the sealing element of an unpressed connection. Fittings 2-1/2" – 4" press end shall have a factory installed means for visual inspection of completed press.
 - c. Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark in the tubing to ensure the tubing is fully inserted in the fitting. The joints shall be pressed using the pressing tool and jaws or jaw set, approved by the fitting manufacturer.
 - d. Fitting installer shall be trained by the fitting manufacturer's factory representative.
 - e. Press connected fittings shall be by VIEGA "ProPress," NIBCO "Press System," AALBERTS "Apollo Press," or equal.
7. Piping shall be run concealed, except where no ceiling is provided. Coordinate installation of piping with other disciplines. Locate all piping tight against structure where possible. No piping shall be installed below mechanical equipment, or within mechanical or electrical equipment clearance requirements.
8. Pitch hydronic piping to vent at high points and provide accessible drains at low points.

B. Valves:

1. Valves 2" size and under shall be bronze with soldered ends, rough bodies, and finish trim. Valves 2-1/2" size and over shall be iron-body, bronze-mounted with flanged ends, except where specifically indicated. Catalog numbers indicated below are NIBCO. Valves with equivalent characteristics by APOLLO, or MILWAUKEE are acceptable.

Size	Pipe Material	Ball/Butterfly
2" and under	Copper	S-585-70-66NS
2-1/2" and over	Copper/Steel	LD-2000

2. Balancing valves 2" and smaller shall be NIBCO "S-585-70-66NS". Valves shall be complete with memory stops. Acceptable alternate valves include MILWAUKEE "BA-150S-MS," or APOLLO "70-200-27."

C. Automatic Balancing Valves

1. Provide automatic measuring and balancing valves where indicated for pipe sizes 1/2" to 12". Valves shall be NUTECH "AB," IMI "AC," or CALEFFI "Series 121" for valves 1/2" through 2".
2. The GPM for the automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5% of the specified amount.
3. For 1/2" - 2", the flow cartridge shall be removable from the Y-body housing without the use of special tools to provide access for cartridge change out, inspection, and cleaning without breaking the main piping. (Access shall be like that provided for removal of a Y-strainer screen).
4. True operating range of 2 - 32 psid required. The design flow should be achieved at the minimum psi differential. A 50% safety factor applied to the lower operating range is not acceptable.
5. Each valve shall have two P/T ports.
6. All automatic flow control devices shall be supplied by a single source.
7. Five-year product warranty and free first year cartridge exchange.
8. The internal wear surfaces of the valve cartridge shall be Ultrason composite or stainless steel.
9. The flow cartridge design shall incorporate a stainless-steel spring which requires no adjustment screw or shims. A crimped sheet-metal design is not acceptable.
10. The internal flow cartridge shall be permanently marked with the GPM.
11. For 1/2" through 2" pipe sizes: The valve shall consist of a brass Y-type body, O-ring-type union, and integral brass body ball valve with memory stop. The ball valve ID shall be minimum standard port (one size smaller than valve connection size) Reduced port valves are not acceptable.
12. For 2-1/2" and larger flanged connections: Ductile-iron body suitable for mounting wafer style between standard 150# or 300# flanges. The long flange bolts and nuts shall be provided with each automatic flow control valve.
13. All valves shall be factory leak tested at 100 psi air underwater.
14. Ratings: 1/2" through 2" pipe size: 600 psig at 250°F
 2-1/2" through 12" pipe size: 600 psig at 250°F
15. Where indicated on the plans, the differential pressure across the automatic flow control valve shall be measured for flow verification and to determine the amount of system over-heading or under-pumping. Where over-heading exists the ball valve shall be throttled to bring the flow cartridge back within the control range. The valve memory stop shall be set so the valve can be used for isolation and reopened to the balanced position.
16. The flow shall be verified by measuring the differential pressure across the coil served or the wide-open temperature control valve and calculating the flow using the coil or valve Cv.
17. A differential pressure test kit shall be supplied to verify flow and measure over-heading. The kit shall consist of a 4-1/2" diaphragm gauge equipped with 10-foot hoses and P/T adapters, all housed in a vinyl case. Calibration shall be 0-35 PSID for 2-32 PSI spring range or 0-65 PSID for 5-60 PSI range.

18. Install automatic flow control valves on the return lines of coils as indicated on the plans. Balancing valve on supply side is not acceptable. Submit proposed piping arrangement for approval by the Engineer.
19. The standard ports and handles shall clear 1" thick insulation. Handle and port extensions are required for over 1" thick insulation.
20. Install, on the supply side of coils, a Y-strainer with a brass blow-down valve with 3/4" hose end connection with cap and chain.

2.07 AIR DISTRIBUTION

A. Ductwork:

1. Provide all ducts, plenums, connections, dampers, and related items required to form a complete system as indicated on drawings and specified herein.
2. All ductwork shall be constructed of sheet metal unless otherwise indicated.
3. Sheet-metal ducts shall be fabricated from G90 galvanized-steel sheets, and shall be of gauges called for and as detailed in 2020 SMACNA Manual, HVAC Duct Construction Standards (Metal and Flexible). All ductwork from variable air volume air handlers to the inlet of VAV terminal boxes shall be 3" w.g. pressure class construction and shall be single wall rectangular and single wall round. All ductwork pressure class construction shall be as indicated on the drawings and shall be single wall rectangular or single wall round. Medium pressure ductwork shall be double wall with 3" insulation encapsulated between inner and outer sheet metal shells.
4. Duct sealing requirements shall be Class A for all ductwork.
5. Round duct and fittings shall be manufactured by a company for whom the manufacture of spiral duct and welded fittings has been a principal business for at least 15 years. Contractor fabricated round spiral duct and fittings shall not be acceptable.
6. All companies being considered as potential suppliers of duct and fitting components shall submit drawings and dimension data for approval. These submittals shall serve as a basis for acceptance or rejection of products.
 - a. All fittings furnished for use on a project shall be identical to the approved submittal data.
 - b. Any fittings rejected by the project engineer shall be replaced with fittings equal to the original approved submittals. All expenses incurred in the replacement of fittings that do not conform to these requirements shall be the responsibility of the installing contractor.
7. All medium-pressure supply duct shall be of round spiral lock seam construction where indicated. Steel round duct shall be of standard spiral with 2C corrugations for all duct greater than 14" diameter (without intermediate ribs) or single-rib construction and shall be provided with gauges according to the following 2020 SMACNA HVAC DCS, except no 28-gauge material is allowed:

Diameter (inches)	Standard Spiral Gauge		Single-Rib Spiral Gauge 0-10" w.g.
	0-2" w.g.	2-10" w.g.	
3-8	28	26	--
9-14	28	26	28
15-26	26	24	28
27-36	24	22	28
37-42	22	20	28

8. Duct shall be provided in continuous, un-joined lengths wherever possible. Except when interrupted by fittings, round spiral duct sections shall not be less than 12 feet long. Round

spiral pipe and fittings greater than 24" diameter shall have flanged connections. All double-wall rectangular ductwork shall have flanged connections. Flanges for double-wall duct shall also hold the inner liner of dual wall duct concentric without the use of additional couplings or spacers.

9. Duct shall be double-wall, spiral, lock seam construction. Where rectangular take-offs for registers are shown, a tack-welded factory- installed take-off shall be provided. Exposed duct shall have "paint grip" finish suitable for field painting. Exposed ductwork shall be "Architectural" grade and shall receive special care in construction and shipping.
10. Double-wall round shall be used where indicated and shall be of spiral lock seam construction with an airtight outer pressure shell, a 3" thick insulation layer, and a solid inner liner that completely covers the insulation throughout. Fittings to have solid inner liner.
11. Unless otherwise specified, all double-wall duct and fittings shall be a minimum G90 galvanized sheet metal. All spiral pipe used for inner and outer shells shall have 3 intermediate ribs and be fabricated in accordance with ASTM A525 and A527 specifications in the following minimum gauges:

Nominal Duct Size	Inner/Outer Shell (Gauge)	Inner Shell (Gauge)
3-24	26	26
25-34	24	26
35-42	22	26

12. Fittings for double-wall duct shall be of the following minimum gauges:

Nominal Duct Size	Inner/Outer Shell (Gauge)	Inner Shell (Gauge)
3-34	22	24
35-48	20	22

13. Round fittings may be spot welded and bonded.
14. Insulation shall have the following UL rating:
 - a. Flame Spread: 10-20
 - b. Fuel Contributed: 10-15
 - c. Smoke Developed: 0-20
15. Round spiral duct and fittings shall be "UNITED MCGILL CORPORATION," "VORTEX METAL MANUFACTURING," "HAMLIN SHEET METAL," "SEMCO MANUFACTURING," "LINDAB," or "EASTERN SHEET METAL."
16. Round ductwork shall not be delivered to the job site until just prior to erection. Ductwork with dents or other damage shall not be accepted. Double-wall acoustically-lined ductwork shall be removed from the job site and shall not be used if liner is allowed to become wet to any degree.
17. Rectangular low velocity ductwork shall be constructed from galvanized steel sheets of lock form quality per ASTM A653 with a G90 zinc coating (0.60 oz/ft²), unless otherwise shown on the contract documents. Sheets shall be free of pits, blisters, slivers, and un-galvanized spots.
18. Insulated-flexible acoustical air ducts shall be FLEXMASTER USA "1M," THERMAFLEX "M-KE," or equal, suitable for up to 10" w.g. positive pressure and rated velocity of 5500 FPM. Flexible ductwork shall meet NFPA 90A standards, conform to UL standard 181, and be ETL listed Class 1 air duct. Flexible duct shall have a flame spread of less than 25 and smoke developed of less than 50. Flexible ductwork shall be fabricated with a polyethylene or chlorinated polyethylene inner film, wrapped in 2" thick with a thermal conductance of R-6 fiberglass insulation, with an outer reinforced metallized vapor barrier.

The inner film shall be supported by a corrosion resistant galvanized steel helix formed and mechanically locked to the polyethylene fabric. The inside bend radius shall be 1/2 x inside diameter in all sizes. Flexible branch ductwork to diffusers shall be limited to maximum length of 5 feet long and maximum velocity of 600 feet per minute. Contractor to provide proper flex duct size to ensure velocity limit is not exceeded. Support flexible ducts a minimum of every 4 feet. Supports shall not compress or constrict the flexible duct. Refer to the diffuser installation details on the drawings.

19. Provide flexible connections of fiberglass between ducts and air-handling unit connections and fan powered VAV boxes. Connector shall be constructed using double lock gripping fingers at metal to fabric contact. Connector shall be rated airtight and watertight up to 10" w.g. positive to 10" w.g. negative pressure. Provide flexible connections, not less than 4 inches wide, constructed of approved fireproof, waterproof, non-asbestos, glass fabric, at the inlet and outlet connection of each fan unit, securely fastened to the unit and to the ductwork by a 24-gauge galvanized steel band provided with tightening screws. Insulation on flexible connections shall be stretched over the metal band and taped to the inlet and outlet connections of the VAV terminal unit. There shall be no metal-to-metal contact at flexible connections. There shall be no stretching of the flexible material at flexible connections. Flexible duct connections at variable air volume terminals shall be a maximum of 3 feet long. The connection shall be UL listed, to meet NFPA 90A and 90B requirements and the following applications:
 - a. Indoor: Neoprene coated glass fabric, minimum 30 oz./sq.yd.
 - b. Outdoor: U.V. resistant Hypalon coated glass fabric, minimum 24 oz./sq.yd.
 - c. Flexible connections shall be DUCTMATE "ProFlex," DURODYNE "Flexible Duct Connector," KINETICS "KINFLEX," or equal.
20. Space suspended duct hangers and roof mounted duct supports every 4 feet, maximum. Insulated duct shall have saddle hangers. Suspended duct hangers attached to the side of the ductwork are acceptable. Refer to duct support details on the drawings.
21. Fabricate ductwork with airtight joints, presenting smooth surface on inside, neatly finished on outside. Unless otherwise indicated, provide square or rectangular elbows and provide double wall turning vanes in all elbows. Deflecting vanes shall be double wall blades, fit into side rails, and screw or rivet to duct elbow in field. Blades and side strips shall be small or large double vanes as detailed in SMACNA Duct Manual. Turning vanes shall be DUCTMATE "ProRail," AERODYNE "H-E-P Turning Vanes," DURODYNE "Vane and Rail" or equal.
22. Construct, brace, and support ducts and air chambers in a manner that they will neither sag nor vibrate to any perceptible extent when fans are operating at maximum speed or capacity.
23. Provide sandwich type or square framed access doors for service temperature and pressure required, where indicated and where not indicated, in locations and of sizes which shall afford easy access to multi-blade dampers, smoke detectors, fire dampers, and other equipment and devices requiring inspection and servicing. Access doors shall be installed to avoid lights, piping, conduit, ceiling grid, etc., to provide unobstructed access. Access doors shall be installed on the underside of the ductwork. Access doors shall be a minimum of 24" x 18" where possible. Access doors in all factory fabricated ductwork shall be factory installed and sizes and locations shall be identified on the ductwork shop drawing submittal. Duct access doors shall be DUCTMATE "Sandwich Access Door," GREENHECK "CAD-10," ACUDOR "CD-5080," or equal.
24. Connect ductwork to intake and discharge louvers, dampers, and other work installed in various trades requiring sheet-metal connections.
25. Make sheet-metal connections to masonry work airtight and watertight in approved manner.
26. Provide opposed-blade dampers for control of air volume and for balancing system, where indicated or required. Dampers shall be of sheet metal at least one gauge heavier than duct and reinforced; shall be installed in an accessible location. Provide indicating quadrant

and locking device for adjusting and locking dampers in position. Provide extended shafts on all volume dampers greater than the thickness of the insulation to provide free movement of damper positioner. Stiffen duct at damper location; install damper in manner to prevent rattling.

27. Where dampers are located above inaccessible ceilings, provide remote cable operated volume damper for control and balancing of air volume. The damper shall be constructed of galvanized steel. The inner wire of the casing shall be stainless steel with tensile strength of 260,000 lbs. For application where the diffuser or grille is installed in hard ceiling below 16'-0" AFF, the adjustable controller shall be installed on either the diffuser or grille face, or mounted to the ceiling surface. Otherwise, provide 50' cable and locate adjustable controller concealed in wall with 3-3/4" cover plate. A list of acceptable manufacturers is listed below:

Manufacturer	Damper Model	Diffuser/Ceiling Mounted Controller	Wall Mounted Controller
UNITED ENERTECH	BO-RI	BO-150	BO-702
DURODYNE	DuroZone	CSB	WSB
METAIRTECH	RT-250	RT-CCM	RT_CCS

28. Provide square to round transition fittings with balancing dampers at all round duct take-offs to supply diffusers and registers.
29. Duct sizes are inside free area. Increase duct sizes as required.
30. Ductwork and accessories shall not be delivered to the job site until just prior to erection and shall be stored in an approved manner.
31. All ductwork shall be internally cleaned by vacuuming prior to installation.
32. All ductwork open ends shall be sealed with polyethylene and duct tape during construction after hanging.

B. Grilles, Registers, and Diffusers:

1. Refer to drawings for types, material, models, finishes, and manufacturers. Air devices shall have performance characteristics (throw, noise, and pressure drop) equal to air devices scheduled on the drawings. Provide performance data with submittal. PRICE, TITUS, GREENHECK, or equal.
2. Grille and register frames and louvers shall be one-piece construction.
3. Paint interior surfaces of ducts behind grilles and registers with flat black enamel.

C. Dynamic 1.5 Hour Fire Dampers:

1. This section contains dynamic curtain-style fire dampers meeting requirements of UL 555 7th Edition. Fire dampers shall be GREENHECK "DFD-110," RUSKIN "DIBD2," POTTORFF "VFD-10D," or equal.
2. Submit the following manufacturer's product data:
 - a. Include UL ratings for fire resistance, velocity, differential pressure, size limitations and mounting orientation.
 - b. Indicate materials, construction, and dimensions.
 - c. Verify conformance to latest versions of NFPA 80, 90A, and 101.
 - d. Include pressure drop data for all damper sizes in accordance with AMCA 500-D test figures 5.2 (Ducted Inlet, Free Outlet), 5.3 (Ducted Inlet, Ducted Outlet) and 5.5 (Free Inlet, Free Outlet).
 - e. Include a copy of UL Installation Instructions.

3. Dampers shall be tested, rated, and labeled in accordance with UL 555 (Seventh Edition), Listing R13317.
4. Performance:
 - a. Dampers shall have a UL 555 fire resistance rating of 1½ hours.
 - b. Each fire damper shall be equipped with a factory installed heat responsive device (fusible link) rated to close the damper when temperature at the damper reaches 165°F.
 - c. Dampers shall have a minimum UL 555 differential pressure rating of 4 in. w.g.
 - d. Dampers shall have a minimum UL 555 velocity rating of 2000 fpm.
5. Construction
 - a. Frame: Galvanized steel in gauges required by manufacturer's UL listing.
 - b. Blades: Galvanized steel curtain style.
 - c. Sleeve: Damper shall be supplied with a factory sleeve.
 - d. Retaining Angles: Damper shall be supplied with factory retaining angles sized to provide installation overlap in accordance with the manufacturer's UL listing.
 - e. Fire Closure Device: Damper shall be supplied with fusible link.
 - f. Mounting: Dampers shall be mounted horizontally or vertically depending on the application. Refer to the Contract Drawings for required orientation.
 - g. Finish: Galvanized steel.
6. Installation
 - a. Install dampers in accordance with manufacturer's UL Installation Instructions, labeling, and NFPA 90A at locations indicated on the drawings. Any damper installation that is not in accordance with the manufacturer's UL Installation Instructions shall be approved prior to installation.
 - b. Dampers shall be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors in ductwork or plenums required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction. Dampers shall be provided with an access door that is not less than 12 inches square or provided with a removable duct section. Access doors shall be permanently identified on the exterior face with a 1" tall label.
 - c. Install dampers square and free from racking.
 - d. Do not compress or stretch the damper frame into the duct or opening.
 - e. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.
 - f. Handle dampers using the frame or sleeve. Do not lift or move dampers using blades, actuator, or jackshaft.
7. All fire dampers must be "drop tested" in the presence of a representative of the Newport News Building Inspection Department.

D. Series Fan-Powered Variable Air Volume Terminal Boxes:

1. Terminal boxes shall be size, type, and capacity indicated on drawings. TRANE CO., or equal by PRICE, TITUS. Units shall be series fan-powered type as indicated. Units shall be ARI certified. Submit sound level data indicating radiated and discharge NC levels for each terminal unit at design airflows.

2. Units shall be complete with insulated casing, electric air valve, and direct digital controls. The direct digital controls shall be furnished by the Temperature Control Contractor and factory installed by the unit manufacturer.
3. Casing: Provide 22-gauge, acoustically lined, galvanized-steel casing. Lining shall be 1" thick, 1.5-lb. per cubic foot density, foil faced, fibrous glass which meets requirements of NFPA 90A. Provide access panel for access to air valves.
4. Primary Air Valve: Provide cylindrical volume control device with electric actuator. Valve inlet shall be 18 gauge steel cylinder sized to fit standard round flexible ductwork. Maximum leakage rate shall be 1% at 4" w.c. pressure differential. Provide with multiple point averaging flow sensor to provide primary airflow measurement within $\pm 5\%$ of rated unit airflow with 1-1/2 diameters of straight duct upstream of unit. Provide integral flow taps and calibration chart on each unit.
5. Fan shall be forward-curved blade, with direct-drive, ECM motor, and disconnect switch.
6. Provide 1" fiberglass media filter with filter frame in plenum intake or ducted inlet as indicated.
7. Electric Reheat Coil: The coil shall factory provided and mounted on the discharge outlet. The coils have a resistance open-type heater with a disc-type automatic reset thermal primary safety device. Heater element material is nickel-chromium. Provide heaters with the following options:
 - a. Mercury Contactor: An electric heater contact for use with direct digital control or analog electronic controls.
 - b. Airflow Switch: An air pressure device designed to disable the heater when the unit fan is off.
 - c. Line Fuse: A safety fuse located in the electric heater's line of power to prevent power surge damage to the electric heater. A line fuse shall be provided for the fan motor to prevent power surge damage to the motor.
 - d. Disconnect Switch: A factory provided disconnect switch with an interlocking door on the heater control panel.
8. Units shall have removable access panel or access door for service access.
9. Units shall be installed with strict attention paid to manufacturer's recommended length of straight inlet duct.
10. Automatic Controls: Provide factory-installed automatic (direct digital) controls provided by the control vendor. The control vendor shall furnish and variable volume terminal unit manufacturer shall install Direct Digital Controller. Controller shall provide the sequence of operation specified. Controller shall provide the required signals to achieve pressure independent operation throughout the specified volume range of the unit. Variable volume terminal unit manufacturer shall examine terminal unit locations indicated on drawings and shall locate controllers on most accessible side of unit. All costs associated with factory mounting of vendor's controls shall be included in this Section.

2.08 VIBRATION ISOLATION

- A. Mechanical equipment indicated below shall be isolated from the structure by resilient vibration and noise isolations. Equipment to be isolated includes, but is not limited to, the following:
 1. Packaged Rooftop Unit
 2. Series Fan-powered VAV
- B. Vibration Isolation Rail System:
 1. Curb mounted rooftop equipment shall be mounted on vibration isolation rails that fit over the roof curb and under the isolated equipment. Curb mounted isolation rails shall be MASON "RSC," VIBRO-ACOUSTICS "ARTR," MGM "ISORAIL," or equal.

2. Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame shall provide continuous support for the equipment and shall be captive to resiliently resist wind forces.
3. All directional neoprene snubber bushings shall be a minimum of ¼" (6mm) thick. Steel springs shall be laterally stable and rest on ¼" (6mm) thick neoprene acoustical pads.
4. Hardware shall be plated, and the springs provided with a rust resistant finish.
5. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows.
6. All spring locations shall have access ports with removable waterproof covers.
7. Lower curbs shall have provision for 2" (51mm) of insulation.

C. Hanger and Guide Supports:

1. Spring Isolators:

- a. Series fan powered variable air volume terminal units shall be suspended with vibration spring isolators. Isolators shall be MASON "30N," VIBRO-ACOUSTICS "SHRB," KINETICS "SRH," or equal.
- b. Hangers shall consist of rigid steel frames containing minimum 1-1/4" thick neoprene elements at the top and a steel spring seated in a steel washer reinforced neoprene cup on the bottom. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability, the boxes shall not be articulated as clevis hangers, nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing and short circuiting the spring.

D. Rooftop Acoustical Systems: Provide acoustical material inside the roof curb as indicated on the Contract Drawings. Acoustical material shall be furnished by the isolation curb manufacturer, and consist of the following:

1. Vibration Isolation Rail System: Provide 2 layers of moisture resistant 5/8" gypsum board on top of 3/8" x 1-3/4" foam pads. Foam pads shall be mounted on 2" aluminum channel that extends the width of the curb rail. The aluminum channel shall be installed above the spring isolator to attenuate acoustical vibrations translated through the roof curb.
2. Provide 2" thickness ROCKWOOL "AFB," OWENS-CORNING "705," or JOHNS MANVILLE "Insul-SHIELD" acoustic batt insulation with 2.8 lbs./sf density on top of the gypsum board.

E. Low Voltage Condensate Overflow Shut-off Switch

1. Low voltage condensate overflow shut-off switches shall be installed on all condensate drain pans as manufactured by RECTORSEAL "AquaGuard," LITTLE GIANT "ACS-2," ASURITY "CC-1," or equal.
2. Mechanical equipment without adequate pan clearance to install a primary drain pan switch shall provide a switch installed on the primary drain pan outlet. The condensate shut-off switch shall detect downstream clogs in condensate drains and interrupts the thermostat circuit to shut off the unit before flooding occurs. Switch shall be RECTORSEAL "Safe-T-Switch," LITTLE GIANT "ACS-5," ASURITY "CS-1," or equal.
3. The condensate shut-off switch shall detect rising water in condensate drain pans and interrupts the thermostat circuit to shut off the unit before flooding occurs. The device shall

be installed on the primary drain pan rim with a two-piece clamp system that does not require drilling.

4. The switch shall incorporate a high capacity 5-amp, 24-volt AC magnetic float switch in a fully housed protective cover. The housing shall include a pull up test knob for functional testing of system.
5. The switch shall include an alarm wire to connect to the BAS. The switch shall send an alarm signal to the BAS front-end workstation. The mechanical contractor shall be responsible for coordinating the switch connections with the controls contractor.
6. The switch shall be UL Listed to comply with UL 508.

F. Bipolar Ionization

1. This section describes the design, performance, and installation of a needlepoint bipolar ionization (NBPI) air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details, and equipment schedules.
2. Project Design
 - a. Maximum ozone emissions shall be in accordance with limits stated in UL 2998. Provide products listed as UL2998-compliant.
 - b. Provide ionization device that does not require preheat protection when relative humidity of entering air exceeds 85%. Device shall be suitable for relative humidity from 0-100%, condensing, without causing damage, deterioration, or dangerous conditions within air ionization system.
 - c. Provide systems that produce positive and negative ions. Unipolar ionization devices are unacceptable.
 - d. Device shall be tested by UL, proving compliance with UL 2998 ozone standard when tested using UL 867 (5th edition) methodology. Perform large chamber testing and peak ozone test for electronic devices in accordance with UL 2998.
 - 1) Demonstrate interior ion concentration levels, both positive and negative collectively, to minimum 2000 ions/cc measured 5 ft from floor where air is delivered from the duct system
 - 2) Provide ionization systems suitable for air exchange rates through full operating range of constant volume or variable air volume (VAV) system.
 - 3) Minimum air velocity: 300 fpm
 - e. Provide ionization device enclosures constructed of corrosion-resistant, non-metallic materials. Configure enclosure without thermal bridging. Provide units certified to UL 2998.
 - f. Provide ionization units having manufacturer's recommended number of electrodes and power generators, sized to system air flow.
 - g. Electrodes shall consist of carbon fiber clusters having minimum 45000 needles each.
 - h. Ionization system shall be energized continuously.
 - i. Additional Design Requirements for Non-Auto Coil Cleaning Installations:
 - 1) Multi-voltage input shall allow 24V or 110-240VAC power supply.
 - 2) Provide magnets for mounting ionization system to fan inlet.
 - 3) Provide integral alarm dry contacts, SPST (NO), rated 0.3 A at 125VAC.
 - j. Additional Design Requirements for Auto Coil Cleaning Installations:
 - 1) Provide electrodes in six-inch sections for field assembly by installer to cover entire finned width of coil.
 - 2) Provide one modular ionization bar for ever 5ft. of coil height.
 - 3) Electrode spacing shall be 0.5 to 1 inch apart.

- 4) Output shall be 140 million ions/cc per inch of bar, measured 1 inch from carbon fiber brushes.
 - 5) Ionization Bars:
 - a) Length shall be 12 ft. maximum
 - b) Provide ac power supply for field installation, capable of powering four ionization bars requiring 20W each.
 - c) Include integral on/off switch and LED “power on” light.
 - d) Include BAS interface alarm dry contacts, SPST (NO), rated 1A at 250VAC.
 - e) Power source shall be 24VAC, 110VAC, or 208-240VAC.
 - f) Power supply enclosure class shall be NEMA 250, Type 4.
 - k. NPBI devices shall be provided with internal short-circuit protection, overload protection, and automatic fault reset circuit breakers.
3. General Installation
- a. Position each electronic air cleaner unit with clearance for service and maintenance. Anchor electronic air cleaners to substrate.
 - b. Install air cleaner devices between upstream filter and cooling coil. Where unit configuration does not allow this installation location, air cleaner devices shall be installed upstream or downstream of supply fan.
4. Factory-fabricated, modular bipolar ionization device
- a. Subject to compliance with requirements, provide GPS “i-MOD,” PHENOMENAL AIRE “Series C Universal,” ATMOSAIR “ActiveOx R” or equal.
 - b. Capacity and Characteristics
 - 1) Materials: Composite and carbon fiber
 - 2) Capacity: 50 to 250 cfm per inch of length
 - 3) Voltage selector switch and illuminated on-off switch
 - 4) LED operational status light
 - 5) Six high-voltage output connections
 - 6) Alarm contacts: SPDT, dry
 - 7) Auxiliary terminals for connections of remote ion sensor
 - 8) Temperature range: -40°F to 140°F
 - 9) Relative humidity range: 0-100%
 - 10) Power Entry: UL listed, line cord with three-prong plug
 - 11) Power unit dimensions: 9” L x 3.25” W x 4.75”H
 - 12) Ionizer bar dimensions: 1.6”H x 0.75” W
 - a) Length per section: 6 inches, having nine brushes per section
 - b) Maximum assembled bar length: 144 inches
 - c) Provide rare earth magnets for mounting
 - 13) Power unit weight: 4.63lb
 - 14) Ionizer bar weight: 0.24lb per 6-inch section
 - c. Electrical Characteristics
 - 1) Electrical Listings: UL/ETL
 - 2) Compliance and Certifications: IAQP, UL 867, UL 2043, UL 2998
 - 3) Input voltage: 24V AC or DC, 110VAC, 240VAC
 - 4) Amperes: 0.5A at 24V, 0.12A at 110V, 0.1A at 240V

- 5) Output power: 5 kV RMS
 - 6) Total ion output: 140 million ions/cc per inch of bar, measured 1 inch from carbon fiber brushes
 - d. Provide ion sensor compatible with ionization device.
 - e. Provide one ionization bar assembly on each coil up to 60 inches in height. Space bars maximum 60 inches apart. Install bar to cover entire finned width of coil to nearest 6 inches without exceeding finned width of coil.
- 5. Auto-cleaning NBPI device for unit mounting
 - a. Subject to compliance with requirements, provide GPS “FC24-AC,” PHENOMENAL AIRE “Series C-6,” ATMOSAIR “ActiveOx R” or equal.
 - b. Capacity and Characteristics
 - 1) Materials: Nonmetallic composite with carbon fiber ion emitters
 - 2) Capacity: 0-2400 cfm
 - 3) Provide integral alarm dry contacts, SPST (NO), rated 1.0A at 250VAC
 - 4) Provide inline on-off switch and programmable autocleaning cycle
 - 5) Temperature range: -20°F to 140°F
 - 6) Relative humidity range: 0-100%
 - 7) Power unit dimensions: 7.9” L x 1.1” W x 5”H
 - 8) Ionizer unit weight: 1.25lb
 - c. Electrical Characteristics
 - 1) Electrical Listings: UL
 - 2) Compliance and Certifications: IAQP, UL 867, UL 2043, UL 2998
 - 3) Input voltage: 24VAC to 240VAC
 - 4) Power Consumption: 4W operating, 8W cleaning
 - 5) Output power: 2 kV RMS
 - 6) Total ion output: 300 million ions/cc, measured 1 inch from carbon fiber brushes
 - d. Provide rare earth magnets for mounting.
 - e. Provide ion sensor compatible with ionization device.
 - f. Install ionization emitter perpendicular to air flow direction. Mount so ion emitters are exposed to, and perpendicular to, airstream. Mount ion emitters so airflow passes between them.

PART 3 - EXECUTION

3.01 TESTS

- A. Refer to Section 230593 “Testing, Adjusting and Balancing” for related requirements.
- B. At their discretion, the Owner shall be represented at all tests. Contractor shall provide 48 hours’ notice to the Owner prior to the tests unless otherwise specified.
- C. Before insulation is installed and before piping is concealed, test water piping hydrostatically and prove tight under 100 psig pressure. Test pressure shall be held for minimum of 8 hours. An air test in lieu of water may be used when danger of freezing is possible and when approved.

3.02 EQUIPMENT COORDINATION

- A. The Prime contractor shall conduct an HVAC Coordination meeting after submission of the HVAC equipment, fire alarm, and controls submittals to the Engineer, and prior to the return of the reviewed controls submittal to the Prime Contractor. The Prime Contractor shall coordinate the meeting time, date, and location with all parties, provide a written agenda, provide written meeting minutes, and provide a detailed issues summary (if unresolved issues remain open after the meeting).
- B. The Prime Contractor shall provide follow-up action as required with the following in mandatory attendance:
 - 1. Prime Contractor Project Manager and Project Superintendent
 - 2. Equipment manufacturer technical services representative (not a sales representative)
 - 3. Controls contractor technical services representative (not a sales representative)
 - 4. Mechanical engineer
 - 5. Owner's representative
 - 6. Fire alarm system representative
- C. The purpose of this meeting is to review equipment, control sequences, and the selected manufacturer's available control points. Upon completion of this meeting, the General Contractor shall be required to submit a meeting report detailing all discussed issues and coordinated solutions. Any unresolved issues shall require another mandatory meeting to ensure all items have been considered and coordinated prior to construction.

3.03 DUCTWORK LEAKAGE TESTING

- A. Test all medium pressure supply duct systems to determine the leakage in the systems. The leakage testing shall be performed in accordance with the requirements of SMACNA - ADLTM in presence of Owner or Owner's Representative.
- B. Coordinate test opening size requirements with the test equipment.
- C. Coordinate scheduling of tests and all preparations for tests with the Engineer and Owner. The Contractor's air balancing Contractor and Owner shall witness all leak tests.
- D. All medium pressure supply air ductwork shall be leak tested at 3.0" w.c. Allowable leakage shall be in accordance with SMACNA HVAC Air Duct Leakage Test Manual.
- E. The air balancing Contractor shall review the test results and provide recommendations for repair and/or modification to any systems which do not meet the allowable leakage rate criteria. Once repairs and/or modifications are complete, the Contractor shall repeat the leakage testing. This process shall continue until the system meets or exceeds the allowable leakage rate criteria. Additional testing shall be performed at the Contractor's expense.
- F. Leakage testing shall be performed prior to above ceiling Punch List, insulation of the ductwork and installation of the finished ceilings.
- G. Forward all test results to the Engineer for review. Provide copy of all tests to Owner upon completion.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING AND BALANCING (TAB)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.

1.02 SCOPE OF WORK

- A. The General Contractor shall obtain the services of an independent testing and balancing agency whose business is limited to testing, adjusting and balancing and shall be certified by AABC (or NEBB). Agency shall have been in the TAB business for a minimum of 5 years. The TAB (Testing, Adjusting and Balancing) Agency shall be a direct subcontractor of the General Contractor and not affiliated in any way with the Mechanical Contractor.
- B. Testing and balancing shall be performed in accordance with National Standards for Testing and Balancing Heating, Ventilating and Air-conditioning Systems, 2002, as published by Associated Air Balance Council (AABC).
- C. All work shall be performed under the direct supervision of a certified TAB Engineer. All other personnel shall be regular full-time employees of the TAB Agency.
- D. Test and Balance Agency shall submit within 30 days after receipt of construction contract two copies of qualifications, including current TAB Engineer's certificate and National Project Certification Performance Guaranty.
- E. TAB work shall not commence until all components of the HVAC system have been installed completely, including all power wiring and controls and all equipment has been started and run tested in each mode of operation. Should any items be found incomplete at the time that TAB work is performed, the TAB Agency shall immediately notify the General Contractor and Owner's Representative of any deficiencies found. The General Contractor shall be responsible for correcting reported deficiencies and verifying that the system is 100% complete, operable and ready for TAB work to proceed.

PART 2 - PRODUCTS

2.01 MATERIAL AND EQUIPMENT

- A. Provide all necessary instrumentation required to measure and adjust the HVAC air and water systems.
- B. Equipment and instruments shall be of types approved by the Owner's Representative and/or manufacturers of devices installed.
- C. Instruments used for testing and balancing of air and hydronic systems shall have calibration verified within a period of 12 months prior to balancing.

PART 3 - EXECUTION

3.01 GENERAL, MECHANICAL AND ELECTRICAL CONTRACTOR'S RESPONSIBILITY

- A. The General Contractor shall be responsible for directing the Mechanical and Electrical Contractors to fulfill the Contractors' Responsibility for Testing, Adjusting and Balancing as

required in Section 230100. TAB work shall not commence until the conditions of paragraph 1.2.E of this Section and all requirements of Section 230100 for TAB have been completed.

3.02 TAB AGENCY'S RESPONSIBILITY

- A. Carefully review the drawings and Specifications for the various systems noting all facilities incorporated in the design for purposes of adjusting and balancing. Should it be deemed necessary to provide additional dampers, baffles, valves, or other devices which would aid in the required adjusting and balancing, same shall be provided by the installing contractor.
- B. The TAB Agency shall report any and all deficiencies that prohibit adjusting and balancing in accordance with the Contract Documents to the Contractor and the Owner's Representative.
- C. Adjust all water piping, duct and equipment, including valves, controls, dampers, etc., to properly perform to $\pm 10\%$ of their respective design quantities of flow.
- D. Determination of the air volumes shall be made by pitot tube and differential draft gauge for all supply, return, outdoor air and exhaust air ducts. Openings for pitot traverses shall be provided as required and shall be fitted with neat removable plugs or covers. Air quantities at grilles, registers, diffusers, etc., shall be measured as recommended by the various manufacturers of the outlets.
 - 1. Fan powered VAV boxes shall be balanced in a manner that assures the design primary airflow is delivered to the VAV box at maximum and minimum air flow. The manufacturer provided flow measurement device may or may not be accurate due to upstream duct conditions. (see 3.2.H.7 for reporting requirements)
- E. The Test and Balance Agency shall perform the following:
 - 1. Adjust fan RPM, tighten and align fan belts, measure operating amps.
 - 2. Adjust volume dampers to obtain designed air volume.
 - 3. Adjust grilles, diffusers and registers to obtain designed airflow and air pattern.
 - 4. Set balancing valves to obtain designed water flow at units, coils and branches.
 - 5. Adjust each air handler to obtain designed airflow.
 - 6. Adjust dampers to provide design outside air quantities.
 - 7. In cooperation with the ATC Contractor's representative, setting adjustments of automatically controlled dampers to operate as specified. The TAB Agency shall inform ATC Contractor of all abnormalities in sequencing and/or calibration of components discovered during balancing.
 - 8. Final settings of dampers and valves shall be permanently marked. Where provided, memory stops and locking devices shall be adjusted and locked to the final setting.
 - 9. Assist Fire Alarm Contractor in the testing of all duct smoke detectors. Measure the air velocity across each duct smoke detector with air handling unit at full airflow.
- F. Before the work is offered for Final Acceptance, all equipment shall be run through a test to demonstrate that it has been adjusted to meet the requirements of the drawings and Specifications. Copies of the test and adjustment data shall be submitted in a report to the Owner's Representative prior to final inspection.
- G. The TAB Report shall include a General Comments section providing an overview of systems operation, observations of system installation abnormalities and deficiencies, problems encountered, etc. If required, provide explanation of methods of measurement and disparity between measured and design quantities.
- H. Test and Balance Agency Report shall include the following data for each system. All sheets shall be neatly typed. Balancing Agency shall submit with his report a set of neatly marked plans

identifying location of each piece of equipment, air terminal, flow measuring device and points of traverse. Report all measured quantities and design quantities where applicable.

1. CFM of each supply, return, exhaust grille and diffuser.
 2. RPM and CFM of each fan.
 3. Supply, return and outdoor air CFM of each AHU and fan terminal unit where required.
 4. Air pressure drop across A/C unit cooling coils.
 5. Air pressure drop across each filter bank.
 6. Discharge and suction static pressure of each fan.
 7. Maximum and minimum differential pressure and corresponding CFM of each terminal box.
 8. Voltage rating and operating volts of each fan motor. For fan motors requiring three-phase power, record voltage of each individual phased leg and check for voltage imbalance.
 9. Temperatures for each air handling unit at maximum capacity including the following measurements:
 - a. Entering and Leaving air temperature at each coil.
 - b. Entering and Leaving water temperature at each coil.
 10. Air Handling unit is defined as any equipment that consists of a fan and coil, including packaged rooftop unit and fan-powered VAV boxes.
 11. Nameplate data of each piece of HVAC equipment installed.
 12. Differential pressure and corresponding GPM across each flow measuring device, including automatic flow control devices.
 13. Final percent setting after adjustment of each balancing valve where applicable.
 14. Velocity across each duct smoke detector at full airflow.
- I. During the Final Inspection, the Agency shall have present all necessary instrumentation and an individual to make readings of select information which was submitted in the balance report. The select readings shall be made where directed by and in the presence of the Owner's Representative and shall not deviate more than 5% from the values submitted in the report.
- J. The Owner's Representative may select no more than 20% of all reported data for rechecking. If more than 20% of data verified is not within $\pm 5\%$ of submitted data, the Owner's Representative may void entire report and ask for complete rebalancing. The field check shall be made within 45 days of approved TAB submittal.

END OF SECTION

SECTION 230700
MECHANICAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 230100 "Mechanical General Provisions" apply to this Section.

1.02 SUBMITTALS

- A. Submit manufacturers' data on all insulation products, schedule which indicates where each product is to be used and thickness of each product.

1.03 WARRANTY-GUARANTEE

- A. Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that work executed under this Section of the Specifications shall be free from defects of materials and workmanship for a period of 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 INSULATION – GENERAL

- A. All insulation shall have a composite (insulation, jacket or facing and adhesive used to adhere the facing or jacket to the insulation) fire and smoke rating as requested by ASTM E84, NFPA 255 and UL 723, not exceeding:

Flame spread	25
Smoke developed	50

- B. Accessories, such as adhesive, mastics, cements, tapes and fire-resistant cloth for fittings, shall have same fire and smoke ratings as components listed above.
- C. Installation of insulation shall be accomplished in strict accordance with manufacturer's recommendations and shall be CERTAINTEED, OWENS-CORNING, JOHNS MANVILLE or KNAUF INSULATION for glass fiber insulation; ARMACELL, AEROFLEX, or AEROFOAM for flexible unicellular insulation.

2.02 PIPE INSULATION

- A. Glass fiber insulation having a thermal conductivity not greater than 0.24 Btu x in./hr. x sq. ft. x °F in a mean temperature of 75°F. Insulation shall have factory-applied all-purpose jacket.
- B. Flexible unicellular insulation having a thermal conductivity not greater than 0.27 Btu x in./hr. x sq. ft. x °F in a mean temperature of 75°F.

2.03 DUCT INSULATION

- A. Blanket Type within the conditioned space: Glass fiber, 3/4-lbs/cu. ft., foil faced, vapor-sealed flexible duct insulation. Thermal conductivity shall not exceed 0.29 Btu x in./hr. x sq. ft. x °F.

- B. Board Type within the conditioned space: Glass fiber, 3.0-lbs./cu. ft., foil faced, vapor-sealed board insulation. Thermal conductivity shall not exceed 0.23 Btu x in./hr. x sq. ft. x °F.

2.04 ACOUSTIC DUCT LINER

- A. Fiberglass duct liner shall not be used.

2.05 INSULATED DUCT COATING

- A. Provide insulated duct coating on all exterior galvanized sheet metal ductwork, POLAR SEAL, ASTEC, or approved equal.
 - 1. Water based acrylic plastic primer “prime security” shall provide 100% adhesion to substrate, stop oil migration and set base for waterproof membrane “top security”.
 - 2. Water-based acrylic plastic waterproof membrane “top security” with bright white reflective heat shield consisting of a high concentrate of titanium dioxide to reflect ultraviolet rays.
 - 3. Membrane “top security” shall be non-chalking, mildew and fungus resistant and crack resistant.
 - 4. Membrane “top security” shall be capable of withstanding sub-zero and extreme heat conditions without degradation. Membrane shall not shrink or become brittle because of age. Membrane shall be resistant to environmental pollution and other chemicals, such as ammonia, chlorine, insecticides, herbicides and other common airborne chemicals.

2.06 CALCIUM SILICATE PIPE INSULATION INSERTS

- A. Calcium silicate pipe insulation inserts shall be provided at all points of contact between hangers and insulated piping larger than 1-1/2”.
- B. Calcium silicate meeting ASTM C533, Type I, water resistant; rigid molded pipe; asbestos-free JOHNS MANVILLE Thermo-1200, or approved equal.
- C. Thermal conductivity of 0.437 Btu at 300°F mean temperature as tested in accordance with ASTM C335.
- D. Minimum compressive strength of 100 psi to produce 5% compression at 1-1/2” thickness.
- E. Non-combustible as determined by test complying with ASTM E136.
- F. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation.

2.07 PVC PIPE JACKET FITTING COVERS

- A. One-piece molded-type PVC plastic fitting covers and jacketing material, color matching JOHNS MANVILLE Zeston 2000, or approved equal.
- B. Connections shall be made using pressure-sensitive color matching vinyl tape.

2.08 COLOR CODED PVC PIPE JACKETS

- A. PVC jackets shall be 28 or 30 mm thick smooth PVC sized to provide a minimum 2" self-gauging overlap, longitudinal and circumferentially. Joints shall be solvent welded.

- B. Jackets shall have a smoke developed value of 50 or less and a flame spread value of 25 or less.
- C. Jackets shall come supplied from the manufacturer color coded in accordance with color code schedule below.
- D. Jackets shall be manufactured by JOHNS MANVILLE model "Zeston 2000", P. I. C. PLASTICS, INC., "FG 30" or approved equal.
- E. Provide fitting covers of same material as jacket and of same manufacturer.
- F. Color Code Schedule (Johns Manville used as basis for colors):
 - 1. Heating Hot Water Supply and Return – Orange

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Insulation shall be installed by a licensed applicator and in strict accordance with the manufacturer's instructions. Deliver all materials to the job site and store in a safe, dry place. Use all means necessary at the job site to protect materials from dust, dirt, moisture and physical abuse before and during installation. Insulation that becomes damaged prior to installation shall not be installed and shall be removed from the job site. Insulation that becomes wet or damaged after installation shall be removed and disposed of and replaced with new insulation.
- B. Surfaces to be insulated shall be cleaned free of dirt, scale, moisture, oil and grease prior to installation of the insulation.

3.02 PIPING (GLASS FIBER INSULATION, UNLESS OTHERWISE NOTED)

- A. Schedule:

Hot Water Heating	1-1/2" thickness for pipe sizes up to 1-1/2" 2" thickness for pipe sizes over 1-1/2"
Condensate drain above floor	1/2" thickness
- B. Fittings and valves on insulated piping smaller than 4" shall be insulated with fiberglass blanket to thickness equal to adjoining pipe insulation unless otherwise noted. Fittings and valves for insulated piping 4" and larger shall be insulated with segments of molded insulation, secured in place. On all fittings and valves, insulation shall be finished with a preformed PVC jacket. Finish all edges of insulation with mastic sealant to ensure no insulation is exposed.
- C. All flexible unicellular and glass fiber piping insulation exposed to the weather shall be provided with aluminum jacketing.
- D. No piping shall be insulated until it has been tested and thoroughly cleaned.
- E. Insulate all hot water piping above the roof line, including inside of outdoor air-handling units. Apply over heat-trace tape.
- F. Provide pipe inserts between pipe hanger support shields and on piping 1-1/2" diameter or larger. Insulation inserts shall not be less in length than the following:

1-1/2" to 2-1/2" pipe size	10" long
3" to 6" pipe size	12" long

8" to 10" pipe size	16" long
12" and above	22" long

3.03 DUCTWORK

A. Definitions:

1. Concealed: Ductwork which shall be hidden from view by ceilings, walls, chases, or soffits, either by the work of this Contract, or by future tenant build-out work.
2. Exposed: Ductwork which is permanently in view, typically found in mechanical, storage, electrical, or other unfinished space.
3. Unconditioned space: Any area not directly served by supply ductwork. Plenum spaces shall be considered conditioned. Attics, mezzanines, and mechanical rooms shall all be considered unconditioned

B. Schedule:

Concealed Supply, Return, and Outside Air Ductwork Externally Insulated: (inside the conditioned space)	2" thickness blanket
Exposed Supply, Return, Air Ductwork Externally Insulated: (outside building)	2" thickness rigid board
Plenums:	2" thickness (or externally insulate with 2" blanket or 1-1/2" rigid board)
Transfer Ducts:	Not Required
Exhaust Ducts:	Not Required
Factory Insulated Casings and Plenums	Not Required
Factory Insulated Double Wall Ductwork	Not Required

- C. Insulate necks and tops of all supply air diffusers, registers and grilles.
- D. Finish all edges of insulation with mastic sealant to ensure no insulation is exposed, where installed outdoors or in unconditioned spaces.
- E. Where installed in conditioned spaces, blanket-type insulation shall be stapled and finished with mastic sealant in accordance with manufacturer's instructions.
- F. Insulation on ductwork over 16" in height or width must be attached with stick pins. When using self-adhesive pins, prepare surface to be applied to ensure adhesion.
- G. Insulation on flexible connections to VAV terminal units shall be stretched over the metal band and taped to the inlet and outlet connections of the VAV terminal unit.

3.04 INSULATED DUCT COATING

- A. Clean galvanized outer surface of sheet metal ductwork as recommended by the manufacturer of the duct coating.

- B. Apply first primer coat of insulated duct coating over all exposed ductwork at a rate of 100 square feet per gallon. Use polyester scrim over any joints or open areas. Completely saturate scrim in the first primer coat of duct coating.
- C. After first primer coat is dry (dries from milky white when wet to clear opaque when dry), apply second primer coat at a rate of 100 square feet per gallon and let dry.
- D. Apply top coat of insulated duct coating at a rate of 100 square feet per gallon and allow to dry.
- E. After first top coat is dry, apply a second top coat of insulated duct coating at a rate of 100 square feet per gallon.

3.05 SELF-ADHESIVE, FIELD-APPLIED, OUTDOOR JACKETS

- A. Ducts shall be sealed in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible - Second Edition (1995) Seal Class B (or latest version of SMACNA) prior to installation of insulation and the outdoor, field-applied jacket.
- B. Outdoor, field-applied insulation and jacket on ductwork insulation shall be pitched to shed water and prevent water ponding on top of the duct.
- C. Fiberglass insulations shall have a factory applied FSK facing. Contractor shall be responsible for testing adhesion to any substrate.
- D. Substrate surfaces shall be clean, dry, and free of oil films.
- E. Select outdoor, field-applied jacket materials in accordance with manufacturer's instructions for coverage on the underside of the ductwork, to avoid pins.
- F. Contractor shall adhere to the following duct installation criteria for proper maintenance of vapor barrier and physical integrity:
 - 1. Board insulation shall be mechanically installed on properly sealed ductwork according to the specifications using insulation fasteners (mini-cup weld pins or perforated. based pins and washers).
 - 2. Washers shall be covered with a 4-inch square piece of smooth foil tape prior to jacketing the ductwork to prevent the puncture of the outer membrane by the fasteners.
 - 3. Insulation on the top of the ductwork shall be installed to allow for the water to shed from the top of the duct and to prevent water from ponding on the top of the duct.
- G. Contractor shall follow one of the options below for the installation of the outdoor, field-applied jacket depending on the jacket product and the duct sizes:
 - 1. Two Piece Installation.
 - 2. Four Piece Installation.
- H. Contractor shall protect outdoor, field-applied jackets from damaging chemicals. Solvation will occur to the rubberized bitumen when exposed to petroleum or coal tar based compounds. Contact the manufacturer immediately for more information if there is doubt, before any chemical interaction.
- I. Contractor shall allow each piece of the outdoor, field-applied jacket to stretch by using a 6-inch lap over the circumferential lap, and a 4-inch wide butt lap or overlap over the joint, and then roll with a roller. Position longitudinal laps at a water shed position.

- J. Contractor shall not pre-apply the outdoor, field-applied jacket to fabricated insulation unless metal banding is used. Outdoor, field-applied jackets are not mechanical fastening systems and will not hold the insulation on the duct.

END OF SECTION

SECTION 230850

INSTALLATION OF HVAC SYSTEMS AND OPERATION PERFORMANCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 230100, "Mechanical General Provisions," apply to this Section.

1.02 WORK INCLUDED

- A. Upon completion of the new work installation, Contractor shall document that all equipment is operating in a manner as prescribed by the contract documents. The contractor shall demonstrate the successful operation of each HVAC component free-standing and as a component of a complete system.
- B. Systems or components found to be malfunctioning shall be reported in writing to the Engineer with a recommended corrective action.
- C. The contractor shall demonstrate the successful operation of the automatic temperature controls system including but not limited to graphical displays, equipment operation and control, HVAC scheduling, performance of sensors, and building optimization during all modes of operation.

1.03 CHECKLISTS AND TEST FORMS

- A. Pre-Start-Up and Start-Up Checklists, prepared specifically for this project, and edited to suit the equipment and systems installed, shall be submitted for review.
- B. Automatic Temperature Controls Checklist, prepared specifically for this project and edited to suit the equipment, and unit-mounted controls, shall be submitted for review.

1.04 SUBMITTALS

- A. Test Schedule: Schedule for equipment and systems start up at least two weeks prior to the start of checks.
- B. Start-Up Report: Completed pre-start-up and start-up checklists reports, organized by subsystems, shall be submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

1.05 START-UP TEAM

- A. The Contractor shall designate team members from each of the following to participate in the Start-Up Process:
 - 1. General Contractor (Quality Control Manager)
 - 2. Mechanical Subcontractor
 - 3. Electrical Subcontractor
 - 4. Automatic Temperature Controls Contractor
 - 5. Factory-trained and certified service technician for all mechanical equipment.
- B. In addition, the Owner's Representative shall be notified 48 hours in advance.

- C. All team members and Owner's representative shall sign-off on start-up test report once tests are complete to the Owner's satisfaction.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 IMPLEMENTATION OF HVAC EQUIPMENT START-UP PLAN

- A. Pre-Start-Up Coordination: As soon as possible after the start of construction and after approval of required equipment submittals, the automatic temperature controls contractor, mechanical contractor, mechanical equipment vendor and certified technician shall schedule a coordination meeting with the Architect/Engineer in order to verify all aspects of the specifications have been coordinated.
- B. Submittal Review: Upon approval of controls shop drawing submittals and after the coordination meeting, the controls contractor shall provide an on-board submittal review with the end-user and Engineer to accurately present the supplied system and products as required by the specification.
- C. Plan Submittal: As soon as possible after the start of construction, the Contractor shall submit the photographic and equipment operation documentation.
- D. Start-Up Checklist: The equipment vendor shall complete and submit the attached automatic temperature controls startup checklist prior to equipment start-up.
- E. Equipment Start Up:
 - 1. Pre-start-up Verification: Prior to start-up of HVAC equipment, the Contractor shall indicate on the pre-start-up checklists that all items have been substantially installed in accordance with the project Contract Documents, including all change orders.
 - 2. Prior to equipment startup, all equipment and associated ductwork shall be cleaned of construction dirt, and debris.
 - 3. Start-up Verification: The Contractor shall indicate on the start-up checklists that all HVAC equipment has been activated and operates substantially in accordance with original operating documentation, with all equipment and electrical operating and safety devices checked and functional. The Contractor's work also includes but is not limited to:
 - a. Calibration and testing of all associated automatic temperature control devices and building automation systems.
 - b. Testing and verification of all interlocks and interfacing between associated HVAC equipment.
 - c. Verification of equipment sequences of operation as outlined on drawings. This shall be done immediately following equipment start up.
 - 4. Start-up Documentation: Completed start-up checklists shall be filled out by the Contractor after start-up verification of each item of HVAC equipment and submitted to the Engineer for review.
- F. Operation and Demonstration:
 - 1. The contractor shall demonstrate to the engineer and owner representatives that all equipment performs in accordance with the sequences of operations as outlined on drawings and in Section 230900. This shall include, but is not limited to the staging of the compressors, electric heat, correct operation of the system fans, and proper operation of the dampers.

2. The contractor shall demonstrate each mode of operation with support from the automatic temperature controls contractor. Modes of operation shall include, but are not limited to building set-up (cool down and warm up modes), occupied, unoccupied, humidity control, staging of heating and cooling modes etc.
 3. The contractor shall demonstrate the DDC graphical interface of system sensors and verify accuracy and calibration.
 4. The contractor shall demonstrate the integration of all system points from the unit mounted controllers to the BAS system.
- G. The Owner's Representative may select no more than 20% of all reported testing and balancing data for rechecking. If more than 10% of data verified is not within $\pm 5\%$ of submitted data, the Owner's Representative may void entire testing and balancing report and ask for complete retesting. The field check shall be made within 45 days of approved start up submittal.

END OF SECTION

SECTION 230900
AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, Section 230100, "Mechanical General Provisions," and Section 230500 "Heating, Ventilating, Air Conditioning" apply to this section.
- B. Original construction drawings shall be made available by the Owner upon request of the Contractor.
- C. Intended modifications to be made to the existing building controls architecture are shown on Contract Drawings M501 and M502.

1.02 WORKMANSHIP

- A. Workmanship shall be first class and of best quality in accordance with approved contemporary construction practices. Defective equipment and materials, or material damaged in the course of installation and tests shall be replaced or repaired in an approved manner.

1.03 APPROVAL OF MATERIALS AND EQUIPMENT

- A. Within 30 days after award of the Contract and before any purchases are made, submit for approval a complete list of materials and equipment proposed, together with names of manufacturers and catalog numbers for each Specification Section. Furnish other detailed information where directed. No consideration will be given to partial lists submitted from time to time. Approval of materials shall be based on manufacturer's published ratings. Materials and equipment listed which are not in accordance with specified requirements shall be rejected. Contractor shall make resubmission of items not approved within 30 days from date of rejections. Submission shall be complete with description, ratings, dimensions and related items and any additional information required by the Engineer.
- B. Materials and equipment shall be new, conforming to these Specifications.

1.04 SUPERVISION

- A. The controls contractor shall maintain a competent foreman on the job at all times to supervise the work and coordinate with other trades for the installation of the system.

1.05 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits and pay all required fees.

1.06 DEFINITIONS

- A. TRIDIUM: American engineering hardware and software company and developer of Niagara Framework.
- B. NIAGARA: Universal software infrastructure developed by Tridium Inc. that allows building controls integrators to build custom, web-enabled applications for accessing, automating and controlling smart devices in real-time via local network or over the Internet.

- C. BACnet: Communications protocol for Building Automation and Control (BAC) networks which provides mechanisms for building automation devices to exchange information, regardless of the particular building service they perform.
- D. JACE: Java Application Control Engine. A JACE is a mechanism/device that provides connectivity to systems within a building via the Niagara framework, and can connect common network protocols (LonWorks, BACnet, Modbus, etc.) to provide a seamless, unified controls system.
- E. DDC: Direct digital controls system. A building DDC system, typically hierarchical, consists of terminal controllers (typically factory- provided and shipped with equipment), system/field controllers (typically provided and installed by controls contractors), and a central workstation to provide a user interface for the various building controls.
- F. Front End: System/building level controller(s) that receive data from terminal controllers throughout the building control system.
- G. Controls Integration: The process of providing a Niagara-based front end, to which all other existing terminal controllers communicate.
- H. Controls Replacement: The process of providing new system/building level controllers, as well as providing new terminal controllers for all building HVAC equipment. All new controllers shall be open protocol and capable of communicating with the Niagara N4 supervising server located at NNPS plant

1.07 SYSTEM DESCRIPTION

- A. Overview: Newport News Public Schools has standardized on the Tridium Niagara N4 (or later Tridium version) platform for its user interface and building controllers for all new building control systems. All new equipment controllers shall be integrated into the Tridium Niagara N4 system architecture for Newport News Center for Student Success. The open protocol Direct Digital Controls(DDC) controllers provided by the controls contractor and/or the HVAC equipment manufacturers shall be connected to the Niagara N4 platform. The controls contractor is responsible for integrating new controls at Newport News Campus for Student Success with the Niagara N4 supervising server located at NNPS plant.
- B. Protocols: Newport News Public Schools standard is to utilize BACnet protocol within the building control system. BACnet factory supplied onboard controllers shall be in their “native” open protocol, avoiding the need for gateways or translators. There may be some instances where a gateway or translator is the only method to integrate a controller, but those shall be submitted to and approved by the consultant engineer on a case-by-case basis.
- C. DDC Controllers: The building control system shall consist of DDC controllers that can stand-alone operate each piece of HVAC equipment (new) or an HVAC system (new) without the use of more than one (1) controller per equipment or system. The DDC controllers will be a combination of factory supplied controllers and control contractor provided and field installed controllers. The coordination of factory controllers vs. field controllers, sensors and integration will be the responsibility of the controls contractor to coordinate with the HVAC equipment providers.

- D. **Factory Installed Controllers:** When a factory installed controller is provided with the HVAC equipment, the manufacturer is required to expose all functional and operational points within that controller to the open protocol communication port on the controller. This may require the manufacturers to create “shadow points” that mirror internal points within the onboard controller. The intent is not to display every point on the user interface graphics, but to ensure that all points are accessible to the building control system. The controls contractor shall coordinate with the equipment supplier to ensure the hand-shake between the building control system and the factory supplied controller is 100% accurate and reliable information. The controls contractor shall be responsible for all field installation of sensors and control wiring for factory supplied controls.
- E. **Building Controllers:** The controls contractor shall furnish and install Building Controllers to incorporate all the new DDC controllers and factory controllers into one seamless harmonic building control system. The Building Controllers shall be based on the Niagara 4 Framework and “open licensed” so that any Niagara approved and qualified contractor can fully access and support the building control system. The controls contractor shall provide the number of DDC controllers needed to fully implement the sequence of operation, regardless of license pricing limitation thresholds.
- F. **Network Communication:** Newport News Public Schools will provide a network communication port in a local data closet. The controls contractor shall furnish & install a CAT5 communication cable from each Building Controller to the designated port on the IT switch. Additionally, the controls contractor shall provide Newport News Public Schools with the Building Controller’s MAC address and location identifier. The JACE passwords shall be provided by Newport News Public Schools to the Contractor. There shall be no other passwords or access to the JACE other than as provided by Newport News Public Schools.
- G. **Server:** Newport News Public Schools has an established and designated server that is running the Niagara N4 Framework. The server applications to be applied by the controls contractor for this project are as follows:
 - 1. **User Login Credentials:** are synchronized via the Newport News Public Schools Active Directory where access privileges are assigned by a designated staff person. The controls contractor shall review & incorporate these user privileges in the building control system as to prevent lower-level users from obtaining specific features that are above their level of authority. Note: these access groups & privileges are well defined on the server.
 - 2. **Point Mapping:** Every point in the building control system shall be mapped to the server by the controls contractor.
 - 3. **Graphics:** The control contractor will be responsible for developing and populating color graphics on the server for the Newport News Campus for Student Success that are in accordance with Newport News Public Schools standards.
 - 4. **Schedules:** The control contractor will be responsible for linking existing schedules from the server to the appropriate areas of the building.
 - 5. **Trending:** The control contractor will be responsible for mapping and archiving all trended points to the server with uploading to the server every 2 hours. Newport News Public Schools will provide to the controls contractor the trend intervals for all point types.
 - 6. **Alarming:** The control contractor will be responsible for developing “smart alarms” which are critical alarms that get transmitted via email and/or text message to designated Newport News Public Schools staff. Note: the smart alarm schedule and distribution list is currently setup on the server.
- H. **User Interface:** The BAS contractor is not required to provide any user interface products such as computer workstations, laptop computers, notebook computers or panel mounted displays. Newport News Public Schools will utilize its existing user interface products to access the building control system through the Newport News Public Schools network.
- I. **Software Editing Tools:**

1. Each JACE shall have embedded work bench software to permit programming changes without the use of the above Niagara Engineering Tool.
- J. The installation of the control system shall be performed under the direct supervision of the controls contractor including; shop drawings, flow diagrams, bill of materials, component designation or identification number and sequence of operation.
- K. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project.
- L. The controls contractor shall be responsible for all Building Automation Systems (BAS), temperature control, 120 volt and low-voltage control wiring for the mechanical system, including interlock wiring for non DDC controlled equipment, for a complete and operable system. Control wiring shall be done in accordance with the specifications, Newport News Public Schools standard practices, and all local and national codes.
- M. The controls contractor shall purchase one (1) 5 year maintenance support agreement for a total of 5 years of coverage, to begin after the initial 18 month support agreement expires. The agreement ownership shall be transferred to Newport News Public Schools

1.08 QUALITY ASSURANCE

- A. The DDC system shall be designed and installed, commissioned and serviced by manufacturer / factory trained personnel. The controls contractor shall have an in-place support facility within 100 miles of the project site with technical staff, spare parts inventory and necessary test and diagnostic equipment.
- B. The controls contractor shall provide a dedicated and experienced Tridium Niagara N4 certified project manager for this work, responsible for direct supervision of the installation, start up and commissioning of the building control system.
- C. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.
- D. All Building Controllers and DDC controllers shall be UL Listed under Standard UL 916.
- E. All programmers working in the N4 platform shall be Niagara 4 certified.
- F. Prior to submitting shop drawings, the Controls Contractor shall lead a coordination meeting between General Contractor, Engineer and Owner to plan the integration of all new system, building, and DDC controllers into the control system. Every control point and startup responsibilities shall be reviewed for a smooth integration process. Meeting minutes shall be prepared and forwarded to participants by the Controls Contractor.
- G. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
- H. The lead programmer shall operate the controls the entire duration of the Commissioning process.
- I. The naming conventions used for this project are provided in Appendix A. No deviations are permitted without express approval of the Engineer.

1.09 WORK BY OTHERS

- A. The Automatic Temperature Controls Contractor shall provide the required branch circuitry (conduit and conductors) between each HVAC Control Panel and electrical panels with spare breakers labeled as "HVAC Controls". The Automatic Temperature Controls Contractor shall coordinate this work with the electrical contractor. Termination at circuit breakers shall be performed by the electrical contractor.
- B. All control and power wiring required for temperature control system and all interlocking and accessory control wiring required for equipment installed under Division 23 Sections shall be installed by the Temperature Control Contractor.

1.10 SUBMITTALS

- A. Submit three complete sets of documentation in the following phased delivery schedule:
 - 1. Equipment data cut sheets
 - 2. System schematics, including:
 - a. Sequence of operations
 - b. Point names
 - c. Point addresses
 - d. Interface wiring diagrams
 - e. Panel layouts
 - f. System riser diagrams
 - g. Auto-CAD compatible record drawings
- B. Upon project completion, submit operation and maintenance manuals, consisting of the following:
 - 1. Index sheet, listing contents in alphabetical order
 - 2. Manufacturer's equipment parts list of all functional components of the system
 - 3. Auto-CAD disk of system schematics, including wiring diagrams
 - 4. Description of sequence of operations
 - 5. As-Built interconnection wiring diagrams
 - 6. Operator's Manual
 - 7. Trunk cable schematic showing remote electronic panel locations and all trunk data
 - 8. List of connected data points, including panels to which they are connected and input device (ionization detector, sensors, etc.)
 - 9. Conduit routing diagrams
 - 10. Backup Niagara logic files for all JACE and Drivers for this project.
- C. Niagara 4 Technical Certification Program (TCP) certificate for all integrating and on-site programmers.
- D. The input setup data for equipment manufacturer provided programmable controllers shall be included in the O&M manual or controls as-built documents. This may take the form of screen shots for each input screen for each controller.

1.11 WARRANTY

- A. Provide all services, materials and equipment necessary for the successful operation of the DDC system for a period of one year after project acceptance.
- B. The adjustment, required testing, and repair of the system includes all new computer equipment, transmission equipment and sensors and control devices.

- C. The on-line support services shall allow the local Controls Contractor to remote-in over the customer's LAN/WAN via secure connection to monitor and control the facility's DDC system. This remote connection to the facility shall be within 2 hours of the time that the problem is reported. This coverage shall be extended to include normal business hours, after business hours, weekends and holidays.
- D. If the problem cannot be resolved on-line by the local office, the national office of the building automation system manufacturer shall have the same capabilities for remote connection to the facility. If the problem cannot be resolved with on-line support services, the Controls Contractor shall dispatch the appropriate personnel to the job site to resolve the problem within 2 hours of the time that the problem is reported.

PART 2 - PRODUCTS

2.01 PRE-APPROVED CONTROL CONTRACTORS

- A. Subject to compliance with requirements of the project documents to provide a complete building control system by one of the following pre-approved companies:
 - 1. HONEYWELL: Controls preferred by licensed Authorized Control Integrator (ACI) contractor.
- B. No additional control contractors will be considered.
- C. Pre-approved controls contractors shall also have completed two projects of similar scope to the Newport News Center for Student Success. Upon request, contractor shall submit a summary of similar completed projects along with the contact information for an Owner's Representative who can serve as a reference.
- D. All equipment with on-board controller shall be Honeywell BACnet Optimizer T1L or BACnet MSTP compatible. Additionally, provide Niagara N4.414 Version 4.8.0.110 on all JACEs or Honeywell CIPer controllers.

2.02 DDC EQUIPMENT

- A. Operator Work Station: This project will utilize existing workstations owned and maintained by Newport News Public Schools.
- B. Server: This project will utilize an existing server and software applications owned and maintained by Newport News Public Schools.
- C. Building Controllers: Provide an adequate number of Building Controllers to achieve monitoring and control of all data points specified and necessary to satisfy the sequence of operation for all mechanical systems shown on the plans. Refer to Appendix A in this section for existing data points. Building Controllers shall be provided as required to accomplish the sequence of operation regardless of software licensing pricing limitations. Each Building Controller shall be connected to the Newport News Public Schools network via Ethernet connection to an IT switch port located in a nearby data closet.
- D. Owner has standardized around the JACE 9000 for all new building controllers.
 - 1. Building Controllers shall be suitable for the anticipated ambient conditions and mounted in dustproof enclosures and shall be rated for operation at 32°F to 122°F and 5 to 95% RH, non-condensing.
 - 2. Serviceability: Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a

- termination card connected by a ribbon cable.
3. Memory: The Building Controls shall maintain all BIOS and programming information in the event of a power loss by utilizing EEPROM auto-save features.
 4. Diagnostics: The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode and generate an alarm notification.
 5. Immunity to power and noise: Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 Watts at 3 ft.
 6. Automatic staggered restart of HVAC equipment after restoration of power with short cycle protection.
 7. The Building Controllers shall provide the interface between the Server and the DDC Controllers and provide global supervisory control functions over the entire building control system. It shall be capable of executing application control programs to provide:
 - a. Calendar functions
 - b. Scheduling
 - c. Trending
 - d. Alarm monitoring and routing
 - e. Time synchronization by means of an Atomic Clock Internet site including automatic synchronization
 - f. Integration of open protocols for BACnet and Modbus
 - g. Central Management functions for all DDC Controllers and integrated controllers.
 8. Building Controllers must provide the following hardware features as a minimum:
 - a. One Ethernet Port – 10/100 Mbps
 - b. One RS-232 ports
 - c. Four RS-RS485 ports electrically isolated
 - d. Power supply 24 VAC or 24 VDC
 - e. Battery Backup
 - f. Real-time clock
 9. Event Alarm Notification and Actions:
 - a. The Building Controller shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
 - b. The Building Controller shall be able to route any alarm condition to any defined user location via Newport News Public Schools network.
 - c. Provide for the creation of a minimum of five (5) alarm classes for the purpose of routing types, Critical, Failure, Trouble, Override, and User-Defined.
 - d. Provide timed (schedule) routing of alarms by class, object, group, or node.
 - e. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
 - f. Control equipment and network failures shall be treated as alarms and annunciated.
 - g. Alarms shall be annunciated in any of the following manners as defined by the user:
 - 1) Screen message text
 - 2) Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
 - 3) Day of week

- 4) Time of day
 - 5) Recipient
 - 6) Graphic with flashing alarm object(s)
 - h. The following shall be recorded by the Building Controller for each alarm:
 - 1) Time and date
 - 2) Location (building, floor, zone, office number, etc.)
 - 3) Equipment (air handler #, access way, etc.)
 - 4) Acknowledge time, date, and user who issued acknowledgement.
 - 5) Number of occurrences since last acknowledgement.
 - i. Alarm actions may be initiated by user defined programmable objects created for that purpose.
 - j. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
 - k. A log of all alarms shall be maintained by the UNC and/or a server (if configured in the system) and shall be available for review by the user.
 - l. Provide a “query” feature to allow review of specific alarms by user defined parameters.
 - m. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
 - n. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.
10. Data Collection and Storage
- a. The Building Controller shall have the ability to collect data for any property of any object and store this data for future use.
 - b. The data collection shall be performed by log objects, resident in the Building Controller that shall have, at a minimum, the following configurable properties:
 - 1) Designating the log as interval or deviation.
 - 2) For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
 - 3) For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 - 4) For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
 - 5) Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
 - c. All log data shall be stored in a relational database in the UNC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.
 - d. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
 - e. All log data shall be available to the user in the following data formats:
 - 1) HTML
 - 2) XML
 - 3) Plain Text
 - 4) Comma or tab separated values

- f. The Building Controller shall have the ability to archive its log data locally (to itself) and remotely to the server.
 - 1) Archive on time of day
 - 2) Archive on user-defined number of data stores in the log (buffer size)
 - 3) Archive when log has reached its user-defined capacity of data stores
 - 4) Provide ability to clear logs once archived
- 11. Audit Log:
 - a. Provide and maintain an Audit Log that tracks all activities performed in the Building Controller. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the Building Controller), to another Building Controller on the network, or to a server. For each log entry, provide the following data:
 - 1) Time and date
 - 2) User ID
 - 3) Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.
- E. DDC Controllers: Modular, comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control applications and standard control applications. DDC Controllers shall be provided for; RTU, VAV Terminal Boxes, and other applications as shown on drawings or identified in the points list.
 - 1. DDC Controllers shall monitor and/or control each input/output point; process information; and provide at least 50 expressions for customized HVAC control including mathematical equations, Boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, enthalpy calculation, counters, interlocks, ramps, drivers, schedules, calendars, OSS, compare, limit, curve fit, and alarms.
 - 2. Capable of stand-alone mode control functions operate regardless of network status.
 - 3. Have a local operator interface port for program download from portable workstation.
 - 4. Shall communicate with the Building Controller using BACnet protocol.

2.03 CONTROL PANELS

- A. Local Control Panels: Unitized NEMA 1 cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.
 - 1. Fabricate panel's 0.06-inch thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.
 - 2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
 - 3. Power Supplies: Provide power supplies that have the line-voltage (120V) totally enclosed as to ensure Arch-Flash Compliance. Only low-voltage shall be exposed within any control panel.
 - 4. Provide ON/OFF power switch with over-current protection for control power sources to each local panel.

2.04 CONTROL CABLE

- A. Network communication cable shall be plenum rated CAT5.

2.05 RACEWAYS AND CONDUITS

- A. Raceways shall be provided for all surface-mounted control wiring.
- B. If existing control wiring above ceilings is installed in conduits, all new control wiring above ceilings shall also be installed in conduits.
- C. J hooks shall be utilized in running control wiring above ceilings and mechanically fastened to walls or hung from supports unless existing architectural or structural conditions do not allow for mechanical fastening.

2.06 CONTROL VALVES (PACKAGED AND UNITARY EQUIPMENT)

- A. Valve housing shall consist of forged brass rated at no less than 360 psi at 250°F. Standard valve ball shall consist of chemical nickel-plated brass. Valve shall have a blow-out proof stem with two EPDM O-rings with minimum 600 psi rating. Valve stem assembly shall be of a pack-less design and be field-replaceable without removing the valve body from the piping. Manufacturer shall be able to provide glass-filled polymer ball insert to make flow control equal percentage. Valves shall be HONEYWELL "VBN" or equal.
- B. 2-way valves shall have EPDM O-rings behind ball seals to allow for a minimum close-off pressure of 100 psi with actuator which provides 35lb-in. torque for ½ to 3 in. sizes. Valve shall be available with a minimum of 53 unique Cv values. Valve shall be available with threaded (FNPT) end connections.
- C. 3-way valves shall be installed in a "T" configuration with actuator perpendicular to the shaft. Valve shall not require elbows of any kind. The 3-way valves shall have EPDM O-rings behind ball seals to allow for a minimum close-off pressure of 40 psi with an actuator that provides 35 lb-in. torque for 1/2 to 2-1/2 in. sizes. The 3-way valves must be available in both mixing and diverting configurations and shall be available with a minimum of 42 unique Cv values. Valve shall be available with threaded (FNPT) end connections.
- D. Direct coupled actuator shall accept analog modulating (0-10Vdc) signal as indicated in the control sequences. Actuators shall be HONEYWELL "MN7507" or equal. Actuators shall provide minimum torque required for full valve shutoff position. Wiring terminals shall be provided for installation to control signal and power wiring. Actuators shall be provided with identification tags indelibly marked with Cv, model number, and tag location.

2.07 CONTROL DAMPERS

- A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:
 - 1. Damper frames shall be 16 gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
 - 2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.
 - 3. Damper shaft bearings shall be as recommended by manufacturer for application.
 - 4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 4 CFM per square foot at 1.0" w.c. differential pressure.
 - 5. All leakage testing and pressure ratings will be based on AMCA Standard 511.
 - 6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.

- B. Control dampers shall be parallel or opposed blade types.

2.08 ELECTRIC DAMPER AND VALVE ACTUATORS

- A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action under all environmental conditions (temperature, low power voltage fluctuations, tight seal damper design, maximum air and water flow forces).
1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
 2. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2": Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
 3. Spring-Return Motors for Valves Larger than NPS 2-1/2": Size for running and breakaway torque of 150 in. x lbf.
 4. Nonspring-Return Motors for Dampers Larger than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
 5. Spring-Return Motors for Dampers Larger than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
- B. Electronic Damper and Valve Actuators: Direct-coupled type non-hydraulic designed for minimum 100,000 full-stroke cycles at rated torque. The actuator shall have rating of not less than twice the thrust needed for actual operation of the damper or valve.
1. Coupling: V-bolt and V-shaped, toothed cradle.
 2. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
 3. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on non-spring-return actuators.
 4. Actuators shall have the ability to be tandem mounted.
 5. All spring-return actuators shall have a manual override. Complete manual override shall take no more than 10 turns.
 6. Power Requirements (Two-Position Spring Return): 24V ac or dc, Maximum 10VA.
 7. Power Requirements (Modulating): Maximum 15 VA at 24V ac.
 8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
 9. Temperature Rating: -22°F to 140°F.
 10. Run Time: 200 seconds open, 40 seconds closed.
 11. All actuators shall have a 5-year warranty.
 12. Automatic Control Valves for Large Hydronic Equipment (Boilers, Pumps, etc.):
 - a. Provide BRAY SERIES 30/31 control valves.
 - b. Size for torque required for valve close-off at maximum pump differential pressure (regardless of water loop system pressures).
 - c. Valve and Actuators shall come from the factory fully assembled.
 - d. Spring Return Manual Override shall come with a 10 Degree Valve Preload to assure tight close off.

2.09 FIRE PROTECTION DEVICES

- A. Smoke detectors shall be furnished by division 28 and installed by the mechanical contractor. Smoke detectors shall be wired to the fire alarm control panel by division 28. Provide interlock wiring to disable supply fan upon a detection of smoke.
- B. Power wiring to the smoke detector and signal wiring from the smoke detector to the fire alarm control panel shall be furnished under division 28. Unit shutdown wiring and control shall be the responsibility of the automatic temperature controls contractor.

2.10 SENSORS

- A. Electronic Temperature Sensors: Vibration and corrosion resistant for wall, immersion, or duct mounting as required.
1. Temperature sensors shall be platinum Resistance Temperature Device (RTD) or 10,000 ohm Thermistor.
 2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 2 feet in length.
 3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
 4. Space sensors shall be equipped with software limited set-point adjustment ± 3 degrees), override switch, and communication port.
 5. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.2°F.
 6. Space sensor guards unless noted otherwise, provide lockable cast aluminum guards for sensors located in the gymnasium, and cafeteria. Provide lockable clear plastic guards in all public areas.
 7. Low-Voltage Space Thermostats shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed set point adjustment, 55°F-85°F set point range, 2°F maximum differential, and vented cover
 8. Line-Voltage Space Thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid state type, with heat anticipator, UL listing for electrical rating, concealed set point adjustment, 55°F-85°F set point range, 2°F maximum differential, and vented cover.
 9. Low-Limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 20 ft long. Element shall sense temperature in each 1 ft section and shall respond to lowest sensed temperature. Low limit thermostat shall be manual reset only.
- B. Humidity Sensors: Bulk polymer sensor element
1. Duct and room sensors shall have a sensing range of 0% to 100% with accuracy of $\pm 3\%$ R.H.
 2. Duct sensors shall be provided with a sampling chamber. Sensors shall be provided with element guard and mounting plate.
 3. Outdoor air humidity sensors shall have a sensing range of 0% to 100% R.H. It shall be suitable for ambient conditions of -20 F to 140°F. Sensors shall be provided with element guard and mounting plate.
 4. Humidity sensor's drift shall not exceed 1% of full scale per year.
 5. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.
 6. Space sensor guards: Unless noted otherwise, provide lockable cast aluminum guards for sensors located in the gymnasium, and cafeteria. Provide lockable clear plastic guards in all public areas.
- C. Equipment operation sensors as follows:
1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 in. wc.
 2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psig.
 3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.
- D. Static Pressure Sensors

1. Sensor shall have linear output signal. Zero and span shall be field adjustable.
2. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.

E. Transformers and Power Supplies:

1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
3. Unit shall operate between 0 C and 50 C.
4. Unit shall be UL recognized.

F. Current Switches:

1. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The controls contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.
- C. The controls contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate, or if any discrepancies occur between the plans and the Contractor's work and the plans and the work of others, the control contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others.

3.02 PROTECTION

- A. The controls contractor shall protect all work and material from damage by its employees and/or subcontractors and shall be liable for all damage thus caused.
- B. The controls contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted.

3.03 COORDINATION

- A. Site:
 1. The project coordination between trades is the responsibility of the prime contractor who is the one tier higher contractual partner, such as Mechanical Contractor, General Contractor, Construction Manager, Owner or Owner's representative as applicable.
 2. The controls contractor shall follow prime contractor's job schedule and coordinate all project related activities through the prime contractor except otherwise agreed or in minor

- job site issues. Reasonable judgment shall be applied.
3. Where the work will be installed in close proximity to, or will interfere with, work of other trades, the controls contractor shall assist in working out space conditions to make a satisfactory adjustment.
 4. If the controls contractor deviates from the job schedule and installs work without coordinating with other trades, so as to cause interference with work of other trades, the controls contractor shall make the necessary changes to correct the condition without extra charge.
 5. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

B. Submittals:

1. Refer to the "Submittals" paragraph in PART 1 of this Specification for requirements.

C. Test and Balance:

1. The controls contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
2. The controls contractor shall provide training in the use of these tools. This training will be planned for a minimum of 2 hours.

D. Coordination with controls specified in other Sections or Divisions of this Specification include controls and control devices that are to be part of or interfaced to the control system specified in this Section. These controls shall be integrated into the system and coordinated by the controls contractor as follows:

1. Each supplier of controls product is responsible for the configuration, programming, startup, and testing of that product to meet the sequences of operation described in this Section.
2. The controls contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this Section and those provided under other Sections or Divisions of this Specification.
3. The controls contractor is responsible for providing all controls described in the Contract Documents regardless of where within the Contract Documents these controls are described.

E. The controls contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the Contract Documents.

3.04 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.05 FIELD QUALITY CONTROL

- A. Controls contractor shall have a 6 Sigma certified (or equivalent certification) quality manager on staff to inspect the project execution and to enforce quality standards.
- B. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in PART 1 of this Specification.
- C. Controls contractor shall continually monitor the field installation for code compliance and quality of workmanship.
- D. Controls contractor shall have work inspected by local and/or state authorities having jurisdiction over the work.

3.06 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this Specification. Where the requirements of this Section differ from those in Division 16, the requirements of this Section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL-Listed in approved 3/4" conduit according to NEC and Division 16 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub fused when required to meet Class 2 current limit.)
- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in conduit may be used provided that cables are UL-Listed for the intended application. For example, cables used in ceiling plenums shall be UL-Listed specifically for that purpose.
- E. All wiring in mechanical, electrical, or service rooms, or where subject to mechanical damage, shall be installed in conduit.
- F. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- G. Do not install control wiring in conduit containing line voltage.
- H. Where plenum-rated cable is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.
- I. Where plenum-rated cable is used without conduit, it shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical conduits, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or wire nut. All wire-to-wire connections shall be at a terminal strip or wire nut.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the Contractor shall provide step-down transformers or interposing relays.

- M. All plenum-rated wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. All wiring in conduit shall be installed as continuous lengths, with no splices permitted between termination points or junction boxes.
- O. Maintain fire rating at all penetrations. Install plenum wiring in sleeves where it passes through walls and floors.
- P. Size and type of conduit and size and type of wire shall be the responsibility of the Contractor, in keeping with the manufacturer's recommendations, NEC requirements, and Division 26 Specifications, except as noted elsewhere.
- Q. Include one pull string in each conduit 3/4 in. or larger.
- R. Control and status relays are to be located in designated enclosures only. These enclosures can include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- S. Conceal all conduit, except within mechanical, electrical, or service rooms. Install conduit to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).
- T. Secure conduit with conduit clamps fastened to the structure and spaced according to code requirements. Conduit and pull boxes may not be hung on flexible duct strap or tie rods. Conduits may not be run on or attached to ductwork.
- U. Adhere to this Specification's Division 16 requirements where conduit crosses building expansion joints.
- V. The controls contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- W. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal conduit less than 1/2-inch electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used. All liquid-tight conduits shall have interior metal core.
- X. Conduit must be adequately supported, properly reamed at both ends, and left clean and free of obstructions. Conduit sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.07 COMMUNICATION WIRING

- A. The controls contractor shall adhere to the items listed in the "Wiring" paragraph in PART 3 of the Specification.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

- E. Controls contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lightning arrestor shall be installed according to the manufacturer's instructions.
- G. All runs of communication wiring shall be un-spliced length when that length is commercially available.
- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.08 DEMOLITION OF OVERRIDE PANELS

- A. Unless otherwise directed by Owner, Override Timer Panels shall be completely removed during the BAS migration to the Niagara-based system.
- B. All new scheduling shall reside in the building front-end and allow requested, approved, and scheduled override activities.

3.09 INSTALLATION OF SENSORS

- A. General:
 - 1. Install sensors in accordance with the manufacturer's recommendations.
 - 2. Mount sensors rigidly and adequately for the environment within which the sensor operates.
 - 3. Room temperature sensors shall be installed in existing junction boxes.
 - 4. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
 - 5. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across the full face of the coil.

3.10 INSTRUMENTATION INSTALLED IN PIPING SYSTEMS

- A. Actuators:
 - 1. Electric/Electronic:
 - a. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.11 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with the DDC address or termination number.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1 cm (1/2 in.) letters on laminated plastic nameplates. Nameplates shall also include "Newport News Center for Student Success, Newport News Public Schools".

- D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- E. Identify room sensors with nameplates.
- F. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
- G. Identifiers shall match record documents.

3.12 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Point Naming standard shall be agreed upon between Owner and Controls Contractor. Refer to "Submittals" in PART 1.
- C. Operator Interface:
 - 1. Standard Graphics – Provide graphics for all mechanical systems and floor plans of the building. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points, such as setpoints.
 - 2. Show Dashboard for all equipment on a "graphic" summary table. Provide dynamic information for each point shown.

3.13 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets that shall be submitted prior to acceptance testing. Commissioning work that requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the Owner and Construction Manager to ensure systems are available when needed. Notify the operating personnel, in writing, of the testing schedule so that authorized personnel from the Owner and Construction Manager are present throughout the commissioning procedure.
- B. Phase I – Field I/O Calibration and Commissioning:
 - 1. Verify that each control panel has been installed according to plans, specifications, and approved shop drawings. Calibrate, test, and have signed off each control sensor and device. Commissioning to include, but not be limited to:
 - a. Sensor accuracy at 10, 50 and 90% of range.
 - b. Sensor range.
 - c. Verify analog limit and binary alarm reporting.
 - d. Point value reporting.
 - e. Binary alarm and switch settings.
 - f. Actuator and positioner spring ranges if pneumatic actuation is utilized.
 - g. Fail safe operation on loss of control signal, pneumatic air, electric power, network communications, etc.
- C. Phase II – System Commissioning:

1. Each DDC program shall be put online and commissioned. The controls contractor shall, in the presence of the Owner and Construction Manager, demonstrate each programmed sequence of operation and compare the results, in writing. In addition, each control loop shall be tested to verify proper response and stable control, within specified accuracy. System program test results shall be recorded on commissioning data sheets and submitted for record. Any discrepancies between the specification and the actual performance will be immediately rectified and re-tested.

D. Phase III – Integrated System Program Commissioning:

1. Tests shall include, but not be limited to:
 - a. Data communication, both normal and failure modes.
 - b. Fully loaded system response time.
 - c. Impact of component failures on system performance and system operation.
 - d. Time/Date changes.
 - e. End of month/end of year operation.
 - f. Season changeover.
 - g. Global application programs and point sharing.
 - h. System backup and reloading.
 - i. System status displays.
 - j. Diagnostic functions.
 - k. Power failure routines.
 - l. Battery backup.
 - m. Testing of all electrical and HVAC systems with other division of work.
2. Submit for approval, a detailed acceptance test procedure designed to demonstrate compliance with contractual requirements. This Acceptance test procedure will take place after the commissioning procedure but before final acceptance, to verify that sensors and control devices maintain specified accuracy and the system performance does not degrade over time.
3. Using the commissioning test data sheets, the controls contractor shall perform an audit comparison to confirm that all existing points have been integrated into the new Building Controller including but not limited to physical inputs and outputs, setpoints, alarm points, and virtual points. Controls contractor shall confirm that any and all slaved points residing on DDC controllers have been recreated in the new Building Controller.
4. The controls contractor shall supply all instruments for testing. Instruments shall be turned over to the Owner after acceptance testing.
5. All test instruments shall be submitted for approval prior to their use in commissioning.
 - a. Test Instrument Accuracy:
 - 1) Temperature: 1/4°F or 1/2% full scale, whichever is less.
 - 2) Pressure: High Pressure (PSI): 1/2 PSI or 1/2% full scale, whichever is less.
 - 3) Low Pressure: 1/2% of full scale (in w.c.).
 - 4) Electrical: 1/4% full scale.
6. The controls contractor shall develop new user interface graphics for dynamic floor plans, dynamic HVAC unit schematics, dynamic central plant diagrams, lighting dashboard, HVAC dashboard, demand response dashboard, alarm console, zone schedules, and point trends.

3.14 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration:

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this Specification. These tests shall occur after the controls contractor has completed the installation, started up the system, and performed his/her own tests.
2. The tests described in this Section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" paragraph in Section 3.12 of this Specification. The Engineer will be present to observe and review these tests. The Engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in PART 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The controls contractor shall conduct a workstation only control point validation by searching for failed or erroneous values. Any and all failed or erroneous values shall be logged and reported to the Owner.
5. Demonstrate compliance with sequences of operation through all modes of operation.
6. Additionally, the following items shall be demonstrated:
 - a. DDC control loop response: The controls contractor shall supply trend data output in a graphical form showing the step response of each DDC control loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
 - b. Optimum start/stop: The controls contractor shall supply a trend data output showing the capability of the algorithm. The change-of value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
 - c. Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the Architect. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and electronic formats.
7. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The controls contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance:

1. All tests described in this Specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the controls contractor may be exempt from the completion requirements if stated as such, in writing, by the Engineer. Such tests shall then be performed as part of the warranty.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in PART 1, "Submittals."

3.15 TRAINING

- A. The controls contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed. Factory employed/ certified instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 7:00 a.m. to 3:00 p.m. weekdays.
- B. Provide a minimum combined 8 hours of on-site training / orientation session and classroom or on-line training session for personnel designated by the Owner. Coordinate training sessions with the owner.

3.16 EQUIPMENT COORDINATION

- A. The Prime contractor shall conduct an HVAC Coordination meeting after submission of the HVAC equipment, fire alarm, and controls submittals to the Engineer, and prior to the return of the reviewed controls submittal to the Prime Contractor. The Prime Contractor shall coordinate the meeting time, date, and location with all parties, provide a written agenda, provide written meeting minutes, and provide a detailed issues summary (if unresolved issues remain open after the meeting).
- B. The Prime Contractor shall provide follow-up action as required with the following in mandatory attendance:
 - 1. Prime Contractor Project Manager and Project Superintendent
 - 2. Equipment manufacturer technical services representative (not a sales representative)
 - 3. Controls contractor technical services representative (not a sales representative)
 - 4. Mechanical engineer
 - 5. Owner's representative
 - 6. Fire alarm system representative
- C. The purpose of this meeting is to review equipment, control sequences, and the selected manufacturer's available control points. Upon completion of this meeting, the General Contractor shall be required to submit a meeting report detailing all discussed issues and coordinated solutions. Any unresolved issues shall require another mandatory meeting to ensure all items have been considered and coordinated prior to construction.

END OF SECTION

SECTION 260100
ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE OF WORK

- A. This Section of the Specifications describes the material and installation procedures to be followed for furnishing and installing the electrical equipment and material as outlined and described on the contract drawings and as stated in this Division of the Specifications.
- B. Where the word "Contractor" appears in this Division of the Specifications, it applies to the Contractor performing the electrical portion of the work, unless specifically indicated otherwise.
- C. The Contractor shall install the systems as specified herein and indicated on the contract drawings and shall furnish all labor, material, tools, scaffolds, erection equipment, services and other items of expense as necessary as a part of this Contract. This Contract further includes placing the systems into operation and properly testing, adjusting, balancing and training the owner's personnel on the use of all items of equipment as specified and as approved by the Architect.

1.03 SUPERVISION

- A. The Electrical Contractor shall have a competent and English-speaking designated Supervisor who is a Certified Master Electrician on the job site at all times that any electrical work is being performed. This shall include any and all electrical work being accomplished by contractors who are subcontractors to the prime Electrical Contractor.

1.04 DRAWINGS

- A. General arrangements of the necessary conduits, feeders, light fixtures, devices, panels, and equipment are indicated on the drawings in diagrammatic form only. Due to the scale of the drawings, offsets, fittings, and accessories may not be shown. Work indicated but having details omitted shall be provided complete to an operating condition with all fittings, wiring, and ancillary equipment and material as required. Where rearrangement is necessary, submit drawings of proposed changes for approval and coordinate and arrange work with consideration to the architectural, structural, mechanical drawings, and the existing building conditions and to the work of the various other building trades. Equipment provided under this Division of the Specifications shall be installed in accordance with the recommendations of the equipment or material manufacturer.

1.05 COORDINATION

- A. Coordinate the electrical work with the architectural, structural and mechanical drawings and work in order to avoid omissions and to eliminate any interference. Report any discrepancies found, as soon as possible, after discovery, to the Architect.
- B. The contractor shall be responsible for coordinating with the Division 23 Contractor for providing properly sized circuit breakers to serve mechanical equipment and motors furnished which differ from that specified or indicated. This shall be further understood to include branch circuit wiring, conduit, disconnect switches, etc., in accordance with the appropriate codes and specifications. The cost of providing this increased electrical service and related work shall be included under the applicable section under which the equipment and motors are being furnished, at no additional cost to the Owner.

- C. The contractor shall coordinate the following electrical requirements for all mechanical equipment with the Division 23 Contractor:
1. Number of electrical connections.
 2. Number and size of feeders' terminal lugs.
 3. Maximum overcurrent protection.
 4. Size and type of fuses.

1.06 CODES AND STANDARDS

- A. Various recognized codes and standards form a part of these Specifications the same as if written fully herein and shall be followed as minimum requirements. The codes and standards will be referred to by their abbreviated names and are listed below. Reference to these standards shall be understood to mean the latest edition and accumulative supplements which have been adopted by the "Authority Having Jurisdiction," unless noted otherwise.

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IECC	International Energy Conservation Code
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
NEC	National Electrical Code (NFPA 70), 2020 Edition
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Prevention Association
NFPA 70E	Standard for Electrical Safety in the Workplace
OSHA	The Occupational Safety and Health Act
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters Laboratories, Inc.
VUSBC	Virginia Uniform Statewide Building Code, 2021 Edition
VEBC	Virginia Existing Building Code, 2021

- B. All equipment, material, apparatus, and work shall conform to the requirements of the NEC. If the Contractor observes that the drawings and specifications are at variance therewith, the contractor shall notify the Architect in writing. If the Contractor performs such work contrary to the above referenced rules and regulations and without written acknowledgment or notice thereto, they shall correct this work and bear all cost arising therefrom.

1.07 NOTICES AND FEES

- A. Give all required notices, obtain all necessary permits, and pay all required fees, including any fees associated with temporary electrical power services during construction. Utility company fees, which are for the permanent installation of electrical power services, shall be paid for by the Owner.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. Refer to Specification 013300 "Submittals", for shop drawing submittal procedures. Submit shop drawings for materials required for this project as indicated herein. Obtain approval from the Architect before manufacture is started on any of same. The shop drawings shall show complete details of the various items, wiring diagrams, etc., and shall be submitted in a sufficient number of copies to allow the Engineer to retain one copy. Approved copies of all shop drawings shall be kept on the job site accessible to the Architect at all times. All new power distribution equipment (switchboards, panelboards, disconnect switches, contactors, and other power related components) shall all be by the same manufacturer.

2.02 ACCEPTABLE MANUFACTURERS

- A. The following list states specific names of acceptable manufacturers of particular equipment and indicates the types of material on which submittals shall be made:

Submittal
Information
Required:

Light Fixtures Product Data

See light fixture schedule on drawings

NOTE: If substitute light fixtures are submitted for review, provide catalog data on the substitution which will provide all the information required to compare it to the specified product. At a minimum, provide dimensional and weight data, coefficients of utilization (CU) information, and photometrics for both the specified and substitute light fixtures. Provide the same catalog data on the specified fixture also. Submittals which don't include both sets of catalog cuts will be returned marked "Furnish Specified Item."

Power Distribution Equipment (Panelboards) Shop Drawings
General Electric / ABB Company
Square D Company
Eaton/Cutler-Hammer
Siemens

Disconnect Switches Product Data
General Electric / ABB Company
Square D Company
Eaton/Cutler-Hammer
Siemens

Surge Protective Devices Product Data
Liebert
Square D
Eaton

Wiring Devices and Cover Plates Product Data
Hubbell
Leviton
Arrow-Hart
Pass and Seymour

- B. The following list states other materials for which product data submittals shall be made:

Circuit Breakers (each type)
Conductors (each type)
Conduit (each type)
Fire Alarm System Components
Fuses (each type)
Intrusion Detection System Components
LED Drivers
Lighting Contactors
Occupancy Sensing Switches (all types)
Infrared scans of the panelboards

- C. Catalog numbers and manufacturers are listed as a guide for minimum requirements to be met. Material and equipment of manufacturers other than those listed will be given consideration by the Architect providing the material meets the minimum requirements set forth in these Specifications and providing the material or equipment will provide satisfactory performance for

the intended installation, does not exceed the dimensions and weight of the specified item and meets the aesthetic performance desired of the specified item. Submittals of other than specified equipment shall have indicated on the specification sheets in the shop drawing submittals each item called for in these Specifications by paragraph and subparagraph numbers and/or letters.

- D. Refer to Specification Section 012500 for substitution requirements.
- E. Any deviation from the manufacturers listed in the preceding list and /or of those stated in the Contract Documents shall be submitted to the Architect for approval in accordance with Specification Section 260500, "Materials and Methods." Facsimile transmission of data for review will not be accepted.
- F. The Engineer will review for approval, only one substitute for each type of material specified in the Division 26 Contract Documents. If the substitute material is not approved, the Contractor shall provide the material by one of the specified manufacturers. Approval of substitute material is at the sole discretion of the Architect and Owner, and the Contractor shall bear all costs arising therefrom, including any design fees if additional design effort is deemed prudent or necessary by the Architect.
- G. Only the types of materials specified herein are approved for use on this project. No other material types will be considered.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. "Provide," as used on the drawings and in these Specifications, shall mean furnish, install, connect, adjust, test, and place into operation, except where otherwise specifically stated in the contract documents.
- B. Provide coordinated electrical systems, equipment, and material complete with auxiliaries and accessories as required for a complete and operable finished project.
- C. Run all conduits concealed except where specifically indicated otherwise. Exposed conduit installation other than where indicated shall be approved by the Architect and Owner prior to installation.

3.02 CLEANING

- A. Remove all dirt, trash, and oil from all raceways, boxes, fittings, cabinets, and panelboards.
- B. Protect, to the satisfaction of the Architect, all equipment provided against damage during construction. If damage does occur to any materials, refinish, repair, or replace the equipment or material as directed by the Architect.

3.03 REPAIR OF EXISTING WORK

- A. Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:
 - 1. Workmanship: Lay out work in advance.
 - a. Exercise care when cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces as necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings and materials or equipment damaged using skilled craftsmen of the appropriate trades.
 - 2. Existing Concealed Wiring to be Removed:
 - a. Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors and cut conduits flush with concrete floors, and top openings with non-shrink grout. Where wood floors are encountered, remove conduit to

below wood floor. Where conduit that passes through walls is removed, seal opening in wall with a material that is equal to the fire rating of the material the wall is constructed from.

3. Continuation of Service:
 - a. Maintain continuity of existing circuits to remain. Existing circuits shall remain energized unless otherwise indicated. Circuits which are to remain but were disturbed during demolition shall have circuit wiring and power restored back to original condition as approved by the Architect. Only materials specified for this project may be used to affect repairs.
 - b. If work on the existing electrical distribution equipment requires power outages, the contractor shall provide a temporary generator to support the existing fire alarm system, security systems (access control, intrusion detection, CCTV), kitchen freezer/cooler, and internet/data/telephone equipment. Coordinate and schedule all power outages in advance with the owner.

3.04 RECORD DRAWINGS

- A. Refer to Specification Section 017839 "Project Record Documents".

3.05 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Specification Section 017823 "Operation and Maintenance Data".
- B. Submit one copy of manual to the Architect/Owner for review by the Engineer.
- C. Furnish three hard copies of manual and a CD containing an electronic version of the Manual in PDF format to the Owner after completion of the Engineer's review.

The following list states materials for which Operation and Maintenance Data submittals shall be made:

- Fire Alarm System Components
- Intrusion Detection System Components
- Light Fixtures
- Power Distribution Equipment (Panelboards, Lighting Contactors and Disconnect Switches)
- Infrared scans of the panelboards
- Occupancy Sensing Switches (all types)
- Surge Protective Devices

3.06 EQUIPMENT INVENTORY

- A. Provide a complete equipment inventory for all Electrical Equipment listed below. Refer to Appendix A in this section for the required template. A separate form shall be provided for each new piece of equipment provided.
- B. Prior to substantial completion, submit the equipment inventory forms for review. Once approved, include the forms in the operation and maintenance manual.

The following list states materials for which equipment inventory shall be made:

- Fire Alarm System Components
- Intrusion Detection System Components
- Light Fixtures
- Power Distribution Equipment (Panelboards and Disconnect Switches)
- Occupancy Sensing Switches (all types)
- Surge Protective Devices

APPENDIX A
New Equipment Inventory

Project Name: **(Add Project Name)**

Project Address: **(Add Project Address)**

Description of Item: _____
(ex. Switchboard, Panelboards, Generator, Lighting, etc.)

Classification:

- ☐ Lighting
- ☐ Power Distribution
- ☐ Auxiliary Systems

Building: _____

Equipment Location (Room Number): _____

Date Purchased: _____

Date Placed in Service: _____

Original Cost: _____

Life Expectancy (years): _____

Estimated Replacement Date: _____

Estimated Replacement Cost: _____

Manufacturer: _____

Model/Serial #: _____

END OF SECTION

SECTION 260500
MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Provide all labor, material, tools, scaffolds, erection equipment, services and supplies to fabricate, install, connect, adjust, test, and place in operation the electrical and other systems as called for in these Specifications and as indicated on the Contract Drawings.
- B. Properly store and protect all material and equipment until installed.
- C. All material and equipment shall be new and of the quality noted or specified. Material, equipment, and work of inferior quality will be rejected and shall be removed from the job site immediately upon rejection and replaced. Unacceptable work shall be removed and replaced. All replacement material and work shall be done at the Contractor expense. The Architect will decide upon the quality of material and equipment furnished and of the work performed.

1.03 WARRANTIES

- A. The Contractor shall provide the Owner with a one-year, unlimited material and labor warranty on all work accomplished and materials provided under Division 26, including all components thereof except as otherwise noted herein or in other specifications. The warranty start date is the date of project "Substantial Completion" as determined by the Architect. All warranties shall be submitted as part of the shop drawing submittals.
- C. Electronic LED drivers shall be free from defect in material and workmanship for a period of five (5) years from the date of project "Substantial Completion" as determined by the Architect.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Electrical material furnished under these Specifications shall be new and listed by UL and shall bear the UL label where labeling service is available for the type of material provided for this project.

2.02 RACEWAYS

- A. Raceways shall be of the size indicated or as required by the NEC; whichever is the larger; except where larger conduits are specified on the Contract Drawings. Raceways shall be 1/2" minimum
- B. Raceways shall be provided for all electrical systems indicated on the drawings unless specifically indicated otherwise. Raceways shall be hot-dip galvanized rigid steel conduit (GRS), electrical metallic tubing (EMT), flexible steel conduit, or intermediate metallic conduit (IMC). Flexible steel conduit outdoors shall be liquid tight. Schedule 40 PVC conduit may be used only below grade, under concrete slabs-on-grade and other locations where specifically indicated.

2.03 CONDUCTORS

- A. Conductors shall be of the American Wire Gauge size indicated on the contract drawings or specified herein.
- B. All conductors shall be copper. The use of Aluminum conductors will not be permitted.

2.04 OUTLETS

- A. Outlet and junction boxes shall be of one-piece galvanized construction of a type and size applicable for use in the location indicated on the contract drawings and as required by the NEC.
- B. Locations of outlets for lighting, devices, power, and equipment are indicated on the contract drawings. Owing to the small scale of the drawings, it is not possible to indicate the exact location. Examine the architectural, structural and mechanical drawings, and finish conditions and arrange work as required to meet such conditions to the approval of the Architect.
- C. Verify the exact swing of doors and locations of furniture and built-in cabinetry prior to installing outlets for switches and receptacles and make the necessary adjustments in location and mounting height of same to avoid conflicts at no additional cost. Coordinate outlets with change orders, addenda, and job site differences.

2.05 FUSES

- A. All fuses shall be provided by the Electrical Contractor.
- B. Fuses shall be as follows:
 - 1. General: All fuses must carry the UL inspected label. All fuses shall be plainly marked with ampere rating, voltage rating, interrupting capacity when greater than 10,000 Amperes and current limiting where it applies and the name or trademark of the manufacturer.
 - 2. Interrupting Capacity: Each fuse shall be capable of safely interrupting the maximum short-circuit current available at the point in the circuit where installed.
 - 3. Coordination: Service fuses and the fuses installed in feeder circuits shall be coordinated to provide a selective system of over-current protection.
- C. Main, feeder, and branch circuit fuses shall be as follows:
 - 1. Circuits 0 to 600 amperes shall be protected by BUSSMANN Low-Peak, Limitron, or Fusetron (RK5, 200,000 I/C) Fuses rated as indicated on the drawings.
 - 2. Motor Circuits: All motors rated 480 volts or less shall be protected by dual-element fuses rated not in excess of 175% and not less than 125% of motor nameplate rating or as indicated. Larger motors as indicated on drawings where fuse gaps are larger than size required for proper rating of fuse, install "all-metal" fuse reducers.

2.06 LABELING

- A. Label all disconnect switches, panelboards and contactors provided under Division 26 of these Specifications.
- B. Labels shall be machine engraved, laminated, Bakelite, nameplate type. Labels shall have black faces with white letters.
- C. Size of labels shall be based on the required lettering and lettering size. The following are the minimum requirements for each type of label:
 - 1. Panelboards: First line of label shall state name of panel as shown on the drawings. Second line shall state from where the panel is fed. Lettering shall be 3/8" high.

Example: Panel L-100
 Fed from MDS
 Circuit # _____
 Voltage _____
 - 2. HVAC equipment with integral disconnects shall be labeled on the outside of the equipment housing at the location of the disconnect in the same manner as Motor Controllers. The HVAC equipment shall be labeled in 1/4" high letters. First line shall

state the name of the equipment as it appears on the electrical drawings. Second line shall state from what panel the equipment is fed.

Example: Roof Top Unit No. RTU-2
 Fed from Panel 100
 Circuit # _____
 Voltage _____

3. Disconnect Switches/Lighting Contactors: Disconnect switches, lighting contactors shall be labeled in 1/4" high letters. First line shall state what the switch/contactors is feeding. Second line shall state from which circuit and panel the switch/contactors is fed.
- D. Circuit breakers serving Fire Alarm Control Panels shall be provided with a red, Bakelite nameplate with white letters attached to the panel adjacent to the circuit breaker.
- E. Attach labels with a minimum of two rivets or sheet metal screws. Adhesive-backed labeling will not be accepted.
- F. Workspace indication for all electrical equipment (Panelboards): Provide 3" wide, 5 mil floor marking safety vinyl tape (striped black and yellow) to show working clearances in the direction of access to live parts. Working clearance around equipment shall not be less than those listed in the N.E.C, Article 110.26 for all voltages specified. Do not install at flush-mounted or surface mounted panelboards and similar equipment in finished spaces, unless directed by the owner.
- G. When a premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit must be identified by phase and system voltage at all termination, connection, and splice points. This shall be provided for all electrical equipment (Panelboards) and shall comply with NEC Article 210.5. Labels shall be color coded as follows: to match the existing color coding if an existing color code is present. If there is no existing color code, provide the following:

<u>120/208-Volt System</u>	<u>277/480-Volt System</u>
Phase A – black	Phase A - brown
Phase B – red	Phase B - orange
Phase C – blue	Phase C - yellow

- H. In existing installations where a voltage(s) already exists and a different voltage system is being added, it shall be permissible to mark only the new system voltage equipment in accordance with NEC 210.5 and paragraph 1.6.G. Labeling shall be provided at each new voltage system distribution equipment. The new system label(s) shall include the words "Other Unidentified Systems Exist On The Premises."

2.07 PULL BOXES

- A. Install pull boxes at all necessary points, whether indicated on the drawings or not, to prevent injury to conductor insulation or other damage that might result from pulling resistance or for other reasons necessary for proper installation. Minimum dimensions shall not be less than the NEC requirements and shall be increased if necessary for practical reasons or where required to fit the job condition.
- B. Above grade pull boxes shall be constructed of galvanized sheet steel, code gauge, except that not less than 12-gauge shall be used for any box. Where boxes are used in connection with exposed conduit, plain covers attached to the box with a suitable number of countersunk flathead machine screws may be used.
- C. All junction and pull box covers shall be labeled indicating the circuits contained therein in a manner that will prevent unintentional interference with circuits during testing and servicing. For example: "HE1-13." See Specification Section 260534 for additional labeling requirements.

2.08 DISCONNECT SWITCHES

- A. Disconnect switches shall conform to governing industry NEMA standards. They shall be listed

by UL. Disconnect switches shall be NEMA standard HD (Heavy Duty), quick-make, quick-break type, and capable of being locked in the off position.

- B. Where disconnect switches are indicated or required by the NEC to be weatherproof, furnish NEMA 3R enclosures.
- C. Arc Flash Warning Labels: Provide all disconnect switches provided by this project with Arc Flash warning labels on the exterior of the switch.

2.09 BRANCH CIRCUITS

- A. The branch circuit wiring has been designed to utilize the advantages of multi-wire distribution and shall be installed substantially as indicated on the drawings. Major changes in the grouping or general routing of the branch circuits require prior approval in writing from the Architect/Engineer.
- B. The number of conductors in each run of conduit is indicated on the drawings, but where there is a conflict between the number of wires indicated and the actual number required as determined by the functional requirements of the connected load, or where the number of wires was inadvertently omitted from the drawings, the correct number and size of wires as determined by the functional requirements of the connected load shall govern and be provided at no additional cost.
- C. Where individual 120V or 277V homerun circuits are shown on the drawings, they may be combined as follows:
 - 1. No more than three phase conductors plus three neutrals and one ground per conduit.
 - 2. No two of the same phase conductor per conduit.
 - 3. Provide 120V circuits with individual neutrals per circuit. Neutrals may not be shared.
 - 4. Neutral sharing by 277V circuits is acceptable.

2.10 MOTOR AND CONTROLLER DISCONNECTING MEANS

- A. Provide a disconnecting means for each motor, where indicated on the drawings. A circuit breaker in a panelboard, horsepower rated switch, or type specified under Article 430 and 440 of the NEC will be acceptable as a disconnecting means, if readily accessible and if located within sight of the motor and in compliance with all codes. A quick-make and quick-break general use tumbler or snap switch will be acceptable for capacities of 20 amperes or less and 300 volts and less, provided the ampere rating of the switch is at least double the rating of the equipment controlled. Switches of 30- to 400-ampere capacity shall be of the enclosed, quick-make and quick-break type, heavy duty, horsepower rated. Switches shall disconnect all ungrounded conductors and shall disconnect grounded conductors if required by the NEC or if called out on the drawings to do so. Switches shall be fusible type where indicated on the drawings.

2.11 CABLE TIES

- A. Provide cable ties in the length required. Standard, indoor cable ties shall be 7.9 inches in length minimum, 0.19 inches in width and 0.47 inches thick. The tensile strength shall be 50 pounds minimum and the maximum bundle diameter shall be 2 inches. Standard cable ties shall be black in color. Plenum rated cable ties shall be 6 inches in length minimum, .075 inches in width and 0.1 inches thick. The tensile strength shall be 50 pounds minimum and the maximum bundle diameter shall be 1.5 inches. Plenum rated cable ties shall be maroon in color.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install material in a first-class and workmanlike manner to the satisfaction of the Architect.

END OF SECTION

SECTION 260519
CONDUCTORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Feeder and branch circuit wiring shall conform to the requirements of the NEC, and shall meet all relevant ASTM specifications.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer for a complete installation and for the application indicated. Provide copper conductors with a conductivity of not less than 98% at a temperature of 20°C (68°F).
- B. Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by installer to comply with project's installation requirements, the NEC, and NEMA standards. Select from the following UL types those wires with construction features which fulfill project requirements:
 - 1. Type THWN or THHN: Max operating temperature not to exceed 90°C (194°F) (THHN) in dry locations, or 75°C (167°F) (THWN) in wet or dry locations. Insulation, flame-retardant, moisture- and heat-resistant, thermoplastic; outer covering, nylon jacket; conductor, annealed copper.
 - 2. Type XHHW: For dry and wet locations; max operating temperature 90°C (194°F) for dry locations, and 75°C (167°F) for wet locations. Insulation, flame-retardant, cross-linked synthetic polymer; conductor, annealed copper.
- C. Service entrance conductors shall be Type XHHW, or THWN.
- D. Unless specified otherwise, power and lighting conductors shall be 600 volt, Type THWN/THHN, or XHHW.
- E. Where light fixtures require 90°C (194°F) conductors, provide only conductors with 90°C (194°F) insulation.
- F. Conductors shall be continuous from outlet to outlet with splices made only in pull boxes, junction boxes, and outlet boxes.
- G. Do not use wire smaller than #12 AWG for power or lighting wiring.
- H. Wiring sizes #12 and #10 AWG shall be solid. Larger sizes may be stranded.
- I. Neutral conductors shall not be under sized.

- J. Where the standard lug sizes on circuit breakers and the main lugs on a main lug only panelboard and other equipment will not accept the conductor size specified, provide Burndy Copper Compression Pin Adapters HYPLUGS or approved equal. The use of Mechanical Pin Adapters will not be accepted.

PART 3 - EXECUTION

3.01 SPLICES

- A. Splicing connectors must have a metal spring that is free to expand. The spring must be suitably coated to resist corrosion. Each connector size must be listed by UL for the intended purpose. The connectors must be suitably color coded to assure that the proper size is used on the wire combinations to be spliced. Each connector must be capable of withstanding 105°C ambient temperatures. The connectors must be compatible with all common rubber and thermoplastic wire insulations. They must also be capable of making copper-to-copper, copper-to-aluminum, and aluminum-to-aluminum splices. At the Contractor's option, self-strapping electrical tap connectors may be used in wire size and voltage range of the connector. When tape is required for splices, SCOTCHBRAND No. 33, or approved equal, shall be used. Use the plastic tape on PVC and its copolymers and rubber-based pressure-sensitive adhesive. The tape must be applicable at temperatures ranging from 0°F through 100°F without loss of physical or electrical properties. The tape must not crack, slip, or flag when exposed to various environments indoor or outdoor. The tape must also be compatible with all synthetic cable insulations as well as cable splicing compounds.
- B. Make splices in conductors #8 AWG and larger with solderless connectors, with molded composition covers.
- C. Connect conductor sizes #12 and #10 AWG with pre-insulated spring connectors rated at not less than 105°C. Connectors shall be UL approved for fixture and pressure work. Connectors shall be 3M CO. SCOTCHLOK, Type Y, R, and B, or approved equal.
- D. Join or terminate conductors #8 AWG and larger with pressure-type copper connectors and properly tape.
- E. All branch circuits, feeders, and control wiring or cables of any type shall be color coded to identify the voltage and phase. The color shall be integral with the Insulation for sizes #12, #10, and #8 AWG. Larger size wire and cable shall be color coded with a minimum 1/2" wide, colored, plastic tape strip. Place strips a minimum of 6" on center anywhere the conductors are accessible and visible. Wire and cable shall be color coded as follows: to match the existing color coding if an existing color code is present. If there is no existing color code, provide the following:

<u>120/208-Volt System</u>	<u>277/480-Volt System</u>
Phase A - black	Phase A - brown
Phase B - red	Phase B - orange
Phase C - blue	Phase C - yellow
Neutral - white	Neutral - gray
Ground - green	Ground - green

- F. After all wiring is pulled and ready for operation but prior to placing systems in service, conduct insulation resistance tests in all feeder circuits. Measure the insulation resistance between conductors and between each conductor and ground. Make measurements with an instrument capable of making measurements at an applied potential of 500 Volts.

- G. Take readings after the voltage has been applied for a minimum of one minute. The minimum insulation resistance for circuits of #12 AWG conductors shall be 1,000,000 ohms. For circuits of #10 AWG or larger conductor, a resistance based on the allowable ampacity of the conductor shall be as follows:

25 through 50 Amperes	250,000 ohms
51 through 100 Amperes	100,000 ohms
101 through 200 Amperes	50,000 ohms
201 through 400 Amperes	25,000 ohms
401 through 800 Amperes	12,000 ohms
Over 800 Amperes	5,000 ohms

- H. Submit the results of the insulation resistance tests to the Architect for approval. Provide readings for each circuit tested indicating the points between which the circuit was tested, reading, date and time of test, and name of the individual performing the test.
- I. Advise the Architect/Engineer in writing of the tests five (5) working days prior to the date the testing is to commence.
- J. Advise the Engineer if the color-coding provided by the utility company differs from that indicated above.

3.02 TEMPORARY WIRING

- A. Temporary wiring is not specified nor governed by this Division of the Specifications.

END OF SECTION

SECTION 260526
GROUNDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Provide grounding for conduits, motor frames, metal casings, receptacles, and solid neutral, and as required by NEC Article 250. Resistance to ground at service shall not exceed 25 ohms.

PART 2 - PRODUCTS

2.01 GROUND WIRE

- A. Provide a green insulated ground wire, sized per the NEC, in all conduits, junction boxes, and pull boxes.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Connect grounding conductors to the panelboard equipment ground bus and not to the panelboard neutral bus. Also connect grounding bushings to the ground bus. Connect the neutral bus only to the system neutral wire. Provide a bonding wire between the equipment ground bus and the neutral bus in the main distribution equipment only. The grounding system (conduit, cabinets, enclosures, and grounding conductors) and the grounded system (neutral conductors and service equipment ground) shall be separate and independent systems, except at the main distribution equipment.
- B. Test resistance to ground and submit readings to the Architect for review. Include the date and time of the test and the name of the individual performing the test.

END OF SECTION

SECTION 260529
SUPPORTING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Extent of supports, anchors, sleeves, and seals is indicated in other Division 26 Sections.
- B. Types of supports, anchors, sleeves, and seals specified in this Section include the following:
 - C-clamps
 - I-beam clamps
 - One-hole conduit straps
 - Two-hole conduit straps
 - Round steel rods
 - Expansion anchors
 - Toggle bolts
 - Wall and floor seals
 - Minerallac Straps
 - 2-Piece Strutt Straps
 - Slotted Channel
 - Cable Ties
- C. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment are specified as part of equipment assembly in other Division 26 Sections.

1.03 QUALITY ASSURANCE

- A. Furnish supporting devices manufactured by firms regularly engaged in manufacture of supporting devices of types, sizes, and ratings required.
- B. Comply with the requirements of the NEC, as applicable to construction and installation of electrical supporting devices.
- C. Comply with applicable requirements of ANSI/NEMA FB1, "Fittings and Supports for Conduit and Cable Assemblies."
- D. Comply with NECA "Standard of Installation" pertaining to anchors, fasteners, hangers, supports, and equipment mounting.
- E. Provide electrical components which are UL-Listed and labeled.

PART 2 - PRODUCTS

2.01 MANUFACTURED SUPPORTING DEVICES

- A. Provide supporting devices complying with manufacturer's standard materials, design, and construction in accordance with published product information and as required for a complete installation, and as herein specified. Where more than one type of device meets indicated requirements, selection is installer's option.
- B. Provide supporting devices of types, sizes, and materials required, and having the following construction features:
 - 1. Reducing Couplings: Steel rod reducing coupling, 1/2" by 5/8"; galvanized steel; approx. 16 pounds per 100 units.
 - 2. C-Clamps: Galvanized steel; 1/2" rod size; approx. 70 pounds per 100 units.

3. I-Beam Clamps: Galvanized steel, 1-1/4" by 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.
 4. One-hole Conduit Straps: For supporting metal conduit through 3/4" galvanized steel; approx. 7 pounds per 100 units.
 5. Two-hole Conduit Straps: For supporting metal conduit above 3/4" galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.
 6. Hexagon Nuts: For 1/2" rod size; galvanized steel; approx. 4 pounds per 100 units.
 7. Round Steel Rod: Galvanized steel; 1/4" dia.; approx. 12.2 pounds per 100 feet, 3/8" dia.; approx. 29.3 pounds per 100 feet, 1/2" dia.; approx. 67 pounds per 100 feet.
 8. Offset Conduit Clamps: For supporting 2" rigid metal conduit; galvanized steel; approx. 200 pounds per 100 units.
 9. 2-Piece strut strap, appropriate size, and type for type of conduit being installed. 1-piece straps are prohibited.
 10. Minerallac straps sized appropriately for the conduit installed. Drilling out the attachment hole is prohibited. Use proper size hardware for attachment per the UL listing.
 11. 7/8" and 1-3/4" slotted channel shall be sized appropriately per the manufacturer's specifications for weight distribution. All feeder conduit racks shall be 1-3/4" minimum.
 12. Cable ties shall be Type 2S and 21S. Install in accordance with Section 330.30(A) of the NEC.
- C. Provide anchors of types, sizes, and materials required and have the following construction features:
1. Expansion Anchors: 1/2"; approx. 38 pounds per 100 units.
 2. Toggle Bolts: Springhead; 3/16" by 4"; approx. 5 pounds per 100 units.
 3. Concrete anchors: Anchors used for attaching 1/4" rod shall be Hangermate one-piece Concrete screw with internal threads or equal. Follow manufacturers installation specifications for proper installation.
 4. Concrete Anchors: Anchors used for attaching 3/8" and 1/2" rod shall Lok Bolt Sleeve anchor type Dewart 05815S-PWR and 05825S-PWR or approved equal. Follow manufacturers technical Data for weight limitations and installation specifications for proper installation.
 5. Drop-in type anchors shall be used only in vertical concrete walls. Hollow wall anchors shall be used in hollow CMU walls. Anchor shall be installed with manufacturer approved set tool.
- D. Provide sleeves and seals of types, sizes, and materials required, and having the following construction features:
1. Provide factory-assembled, watertight wall and floor seals suitable for sealing around conduit, pipe or tubing passing through concrete floors and concrete block walls. Construct with steel sleeves, malleable-iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps and cap screws.
- E. Provide U-channel strut system for supporting electrical equipment, 16-gauge hot-dip galvanized steel of sizes required; construct with 9/16" dia. holes, 8" o.c. on top surface, and with the following fittings which mate and match with U-channel:
- Fixture hangers
 - Channel hangers
 - End caps
 - Beam clamps
 - Wiring stud
 - Rigid conduit clamps
 - Conduit hangers
 - U-bolts

PART 3 - EXECUTION

3.01 INSTALLATION OF SUPPORTING DEVICES

- A. Install hangers, anchors, sleeves, and seals as indicated in accordance with manufacturer's published instructions and with recognized industry practices to ensure supporting devices comply with the requirements of the NEC, NECA, and ANSI/NEMA for installation of supporting devices.
- B. Coordinate with other electrical work, including outlet box, raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps, and attachments to support conduit and outlet boxes properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze-type hangers where possible. Install supports with maximum spacings indicated.
- D. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

END OF SECTION

SECTION 260533
RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Run all conduit concealed, except conduit may be run exposed in mechanical rooms, locations where specifically indicated, and spaces with exposed construction as approved by the Architect.
- B. Provide a conduit system complete with fittings and hangers as specified herein and as required by the NEC. Run all electrical wiring systems above 24 Volts in conduit unless specifically indicated otherwise.
- C. Install conduit as a complete system without wiring and continuous from outlet to outlet and from fitting to fitting, mechanically and electrically connected to all boxes, fittings, and wireways, and grounded in accordance with the NEC.
- D. Cap ends of all conduit promptly upon installation with plastic pipe caps. Caps shall remain until wiring is ready to be installed. Taping the ends of conduits is not acceptable.
- E. Size conduit to equal or exceed the minimum requirements of the NEC (except where sizes are specifically indicated on the drawings and in these specifications).
- F. Verify exact swing of doors, prior to installing conduit for switches. Coordinate switches with the Architect's plans, change orders, addenda, and job site differences and make the necessary adjustments to avoid conflicts at no additional cost.
- G. Coordinate the routing of conduit with other trades to avoid conflicts with structural members, piping, ductwork, and other job site conditions.

PART 2 - PRODUCTS

2.01 CONDUIT

- A. Minimum size conduit shall be 1/2" unless noted or indicated otherwise on drawings. Use larger sizes as required by the NEC to accommodate the number and sizes of wires contained therein.
- B. Conduit concealed in walls or above ceilings shall be rigid (GRS), electrical metallic tubing (EMT), or intermediate metallic conduit (IMC). Flexible conduit may be used above accessible ceilings only.
- C. GRS, EMT and IMC shall be UL approved, hot-dip, high-strength, galvanized steel.
- D. Flexible conduit shall be galvanized, continuous spiral, single strip type. In areas subject to moisture, and where specifically indicated, flexible conduit shall have a plastic covering in accordance with NEC Article 350. Fittings shall be standard UL approved with ground connector. Watertight connectors shall be used with plastic-covered conduit. All flexible conduit installed shall be plastic covered. The maximum length for flexible conduit is 72" unless as otherwise indicated. . Liquid tight flexible metal conduit (LFMC) is prohibited where subject to physical damage and areas where ambient and conductor temperature exceed the approved operating temperature. Cable ties used to support LFMC shall be type 2S or 21S.
- E. Conduit may not be run in the flutes of metal roof decking and may not be attached to any part of metal roof decking.
- F. Contractor shall use rubber-based pipe support blocks with galvanized strut, Dura-Blok or equal

to support all conduits installed on the roof. Provide all the required accessories to support all conduits. Provide a rubber roof membrane barrier equal to the thickness of the roof membrane. Barrier shall be permanently attached to the block.

2.02 FITTINGS

- A. All conduit entering or leaving panelboards, cabinets, outlet boxes, pull boxes, or junction boxes shall have lock nuts and bushings, except provide insulated throat connectors on EMT conduit 3/4" and 1". Rigid steel conduit shall have a lock nut both inside and outside of the enclosure entered. Install bushings on the ends of IMC conduit and EMT conduit larger than 1". Insulating bushings shall be OZ Type A for GRS and IMC, and Type B for EMT. Conduit entering enclosures through concentric knockouts shall have grounding-type bushings with copper bond wire to enclosure.
- B. Provide expansion fittings where conduits cross building expansion joints. Expansion fittings shall be OZ Type AX with OZ Type BJ bonding jumper. See Architectural drawings for location of expansion joints.
- C. Fittings for rigid conduit shall be threaded type, except where IMC changes to EMT above fittings shall be threadless type.
- D. Fittings for EMT shall be UL-approved, steel set screw couplings.
- E. Conduits entering service enclosures (panelboards, disconnect switches, switchboards, motor control centers, etc. used as service entrance equipment) shall be provided with specification grade, insulating, grounding type bushings. Grounding bushing shall be bonded together and bonded to the service grounding buss.

2.03 JUNCTION BOXES

- A. Use junction boxes on exposed conduit work for changes in direction of conduit runs and breaking around beams and columns.
- B. Furnish covers and gaskets with the junction boxes where installed in damp or wet locations.
- C. Label all junction and pull box covers indicating the circuits contained therein in a manner that will prevent unintentional interference with circuits during testing and servicing. For example: "HE1-13." See Specification Section 260534 for labeling requirements.

2.04 PIPE SLEEVES

- A. Provide pipe sleeves where conduits larger than 2" pass through walls. Contractor shall be responsible for proper and permanent location. Conduit shall not be permitted to pass through footings, beams, or ribs, unless indicated and/or approved. Coordinate pipe sleeve locations with all other trades affected.
- B. Install pipe sleeves and properly secure in place with grout where conduit passes through masonry or concrete and at all fire-rated assemblies. Pipe sleeves shall be of a sufficient diameter to provide approximately 1/4" clearance all around the conduit. Fill void between conduit and sleeve with mineral wool to prevent sound transmission. Pipe sleeves in foundation walls shall be cast iron, 2" larger in diameter than the conduit installed. Pipe sleeves in walls, and partitions shall be Schedule 40 black steel pipe. Extend sleeves least 1", pack space around conduit with fireproof material, and make watertight. Pipe sleeves passing through firewalls, smoke partitions, fire partitions, shall be sealed with a UL-rated system appropriate for the specified rating.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install conduit concealed in walls, and above ceilings, except conduit may be run exposed in mechanical and electrical equipment rooms. Maintain a minimum clear distance of 6" from parallel runs of flues, steam, or hot water pipes. Do not run conduit horizontally in concrete slabs.

- B. Use flexible conduit (minimum 18" in length, maximum 72" in length) for connections to all motors, dry-type transformers, water heaters, and any equipment subject to vibration.
- C. Group conduit so it is uniformly spaced, where straight and at turns. Make bends and offsets (where unavoidable) with a hickey or bending machine.
- D. Ream GRS and IMC conduit after threading to remove all burrs.
- E. Securely fasten conduit to outlets, junction boxes, and pull boxes to affect firm electrical contact. Join conduit with approved couplings. Running threads are not allowed.
- F. Exercise care to avoid condensation pockets in the installations. Keep conduit, fittings, and boxes free from foreign matter of any kind, before, during, and after installation.
- G. Do not use EMT below grade, outdoors and in wet locations.
- H. Support exposed runs of conduit in accordance with N.E.C. 342, 344, 348, 350 and 358 and parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings with right angle turns consisting of fittings or symmetrical bends. Support conduit within one foot of all changes in direction and on each side of the change.
- I. Supports shall be wall brackets, trapeze, strap hanger, or pipe straps, secured to hollow masonry with toggle bolts or Hollow wall anchors; to brick and concrete with expansion Anchors; to metal surfaces with machine screws; and to wood with wood screws. Overhead conduits supported by threaded rod from concrete shall be those listed in the approved hanger specification and conform to the manufactures technical data and installation specifications.
- J. Use explosive drive equipment to make connections where the use of this equipment is beneficial, and is subject to strict compliance with safety regulations and approved by the Owner.
- K. Wooden plugs inserted in masonry and the use of nails as fastening media are prohibited.
- L. Do not support conduit from lay in tile ceilings grids, ceiling grid hangers, or lay on ceiling tiles.
- M. Prime conduit with a surface conditioner "GalvaGrip" or approved equal and paint to match the surface on which attached. Conduit installed in mechanical and electrical rooms need not be painted.
- N. Install and support conduit from the underside of the upper chord in bar joist construction.
- O. Do not support conduit from or attach outlet or junction boxes to metal roof decks.
- P. Where conduits penetrate through non-fire-rated ceiling, or walls, seal the conduits with a fire-resistant caulk to prevent liquids and insects from passing through.
- Q. Where conduits penetrate through fire-rated ceiling, or walls, provide a UL-Listed, water-resistant firestop material with a rating equal to or greater than the rating of the penetrated ceilings, or walls.
- R. Metal conduit installed in earth shall be painted with two coats of bitumastic paint.
- S. All conduit runs entering the building from outdoors shall be sealed against moisture migration and condensation by filling with insulating type foam.
- T. Single runs of conduit 1/2" to 1-1/2" in diameter shall be supported by 1/4" round galvanized rod. Single runs of conduit 2" and larger shall be supported by 3/8" round galvanized rod. Single tier conduit racks with conduit 1/2" to 1" and no greater than five shall be supported by 1/4" round galvanized rod. Single tier conduits racks 1-1/4" and larger shall be supported with 3/8" round galvanized rod. All conduit racks larger than a single tier shall be 1/2" minimum round galvanize rod. Conduit and conduit racks shall comply with the manufacturer's supporting limitations.

END OF SECTION

SECTION 260534
ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Furnish and install all junction boxes of a type and size applicable for use in the location indicated on the drawings and where required by the NEC.
- B. Exercise special care in the location of outlet and junction boxes in order that the hanging or recessing of light fixtures will not be obstructed by piping or ductwork installed by other trades. To this end, coordinate the work with representatives of the other trades involved and by reference to the architectural, structural and mechanical.

PART 2 - PRODUCTS

2.01 OUTLET BOXES

- A. Outlet boxes shall be sheet steel, zinc coated, or cadmium plated.
- B. Provide existing and new outlet boxes installed but not used, including data outlets, with blank coverplates matching those provided on adjacent outlets.
- C. Size boxes as follows:
 - 1. Switch and Receptacle Outlet Boxes: Provide single gang outlet boxes 1-1/2" deep unless required to be larger. Provide extra deep boxes where required.
 - 2. Fixture Outlets in Ceiling: 4" octagonal, minimum. Where required to accommodate larger conduit or a larger number of wires: 4-11/16" by 2-1/8" deep.
 - 3. One-piece multi-gang boxes for use where two or more switches or receptacles are located side by side: 2-1/8" deep. Sectionalized boxes will not be allowed.
 - 4. Where larger size boxes are required or called for, they shall be similar in all other respects to the types specified above.
- D. Light fixture outlet boxes, where fixtures are to be mounted on the box, shall have suitable studs and supports for carrying the weight of the fixture. Increase box depth, as required, for additional wires and conduits.
- E. Boxes in new finished walls shall be flush mounted and have flush coverplates and proper type extension rings or plaster covers where required. Provide blank Series 302 stainless-steel coverplates on boxes not scheduled to receive coverplates of an otherwise specified type. coverplates on boxes not scheduled to receive coverplates of an otherwise specified type. If an extension ring is used to extend a junction box, one extension ring shall be used per box.
- F. Provide boxes located above suspended ceilings with galvanized steel covers, with openings or knockouts as required for type of service.
- G. Boxes installed in concrete construction shall be galvanized concrete type at all locations except where conduit or cast-iron boxes are required for watertight or vaportight outlets.

2.02 PULL BOXES AND JUNCTION BOXES

- A. Install pull boxes and junction boxes where required for changes in direction, at junction points, and where needed to facilitate wire pulling.
- B. Size boxes in accordance with the requirements of the NEC.

- C. Boxes shall be constructed of 12-gauge minimum hot-rolled sheet steel and shall be hot-dip galvanized inside and outside to match the conduit. Boxes shall have removable covers.
- D. Label the front face of the cover on each box with indelible black marker indicating the number of each circuit contained in or running through the box. In areas where exposed construction is the final finished condition and conduit and junction boxes are called out to be painted, label the inside face of the covers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Check all door swings and coordinate with all furniture, built-in equipment, and cabinetry prior to roughing-in conduit and boxes for switches, receptacles, and auxiliary system devices. Make necessary adjustments in the location of same to avoid conflicts as approved by the Architect and at no additional cost to the Owner.
- B. Install all outlet boxes flush with wall or ceiling finish.
- C. Mounting heights of outlets in tile or unplastered masonry shall be varied plus or minus to the nearest block joint so the bottom or top of the box rests on a block joint. Install outlet boxes in the same space at the same height above finished floor unless indicated or required to be otherwise.
- D. Check the location of all wall outlets prior to roughing-in conduit to verify that the outlet will clear any wall fixtures, shelving, work tables, etc., that exist or will be installed. Make necessary adjustments in the location of wall outlets to avoid conflicts as approved by the Architect and at no additional cost to the Owner.
- E. Prior to roughing-in conduit, coordinate with other trades and the Owner regarding all equipment requiring electrical connections. Required adjustments to the conduit and wire sizes shall be made at no additional cost.
- F. Conduit installation shall be rigid and secure, and, where necessary, angle iron (1" by 1" by 1/4" or larger) shall be provided to facilitate adequate mounting.
- G. Install electrical boxes and fittings in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- H. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- I. Provide "weatherproof-while-in-use" rated outlet covers for interior and exterior locations exposed to weather or moisture.
- J. Provide knockout closures to cap unused knockout holes where blanks have been removed in panel cans, terminal cabinet backboxes, junction boxes, outlet boxes and pull boxes.
- K. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- L. Do not install boxes back to back in walls. Provide not less than 6" (150 mm) separation. Thru-the-wall boxes may not be used.
- M. Position recessed outlet boxes accurately to allow for surface finish thickness.
- N. Subsequent to installation of boxes, protect boxes from construction debris and damage.
- O. Upon completion of installation work, properly ground all electrical boxes.
- P. Do not mount boxes to metal roof decking.

END OF SECTION

SECTION 262200
DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Extent of transformer work is indicated by drawings and schedules.
- B. Types of transformers specified in this Section include K4-rated dry-type transformers.
- C. Electrical wiring connections for transformers are specified in applicable Division 26 Sections.

1.03 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to installation and construction of electrical power distribution transformers.
- B. Comply with applicable portions of NEMA TR1 and DOE 2016 minimum Standards for power distribution transformers.
- C. Comply with applicable requirements of ANSI C57-Series pertaining to power distribution transformers.
- D. Comply with requirements of NEMA ST20, "Dry-type Transformers for General Applications,".
- E. Comply with applicable requirements of ANSI/UL 506, "Safety Standard for Specialty Transformers." Provide power distribution transformers and components which are UL-Listed and labeled.
- F. Comply with applicable requirements of NESC (ANSI C2) pertaining to indoor and outdoor installation of transformers.

PART 2 - PRODUCTS

2.01 POWER DISTRIBUTION TRANSFORMERS

- A. Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for complete installation. All transformers shall be products of a single manufacturer.
- B. Dry-type Distribution Transformers: Provide factory-assembled, DOE 2016 compliant and K4 rated, air-cooled, dry-type distribution transformers where shown; of sizes, characteristics, and rated capacities indicated; 3-phase; 60 Hz, 30kV BIL, 4.0% nominal impedance, copper windings, with 480-Volts delta connection primary and 208/120-Volts secondary wye connected. Provide primary winding with six 2-1/2% taps; two above and four below primary rated voltage. Transformers 15kVA and above shall be rated for 150°C temperature rise above 40°C ambient except K4 rated transformers shall be rated for 115°C temperature rise above

40°C ambient. All insulating materials shall be in accordance with NEMA ST20 Standard for a 220°C UL component recognized insulation system. Limit transformer surface temperature rise to maximum of 65°C. Provide terminal enclosure, with cover, to accommodate primary and secondary coil wiring connections and electrical supply raceway terminal connector. Equip terminal leads with connectors installed. Provide wiring connectors suitable for copper wiring. Sound levels shall not exceed the following: 15 to 50kVA = 45 dB. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards. Provide transformers with fully enclosed sheet-steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for floor or wall mounting as indicated. The transformers shall be listed by UL for the specified temperature rise.

- C. Provide transformers with weatherproof Nema 3R enclosures, whether indicated or not, when installed outdoors.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which power distribution transformers and ancillary equipment are to be installed and notify the General Contractor, in writing, of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated, complying with manufacturer's published instructions (including rear ventilation clearances), applicable requirements of the NEC, NESC, NEMA, ANSI, DOE and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.
- C. Connect transformer units to electrical wiring system; comply with requirements of other Division 26 Sections.
- D. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
- E. Provide 4" thick concrete housekeeping pad under all transformers. Exceed dimensions of transformer by 6" on all sides. Chamfer all exposed edges 1/2".
- F. Keep transformers clean and free from foreign matter of any kind, before, during, and after installation.
- G. Provide sufficient space around transformer for cooling as recommended by the manufacturer. Provide a minimum space of 8" between the transformer and any wall.

3.03 GROUNDING

- A. Provide equipment grounding connections for power distribution transformers as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

3.04 TESTING

- A. Prior to energization of transformers, check all accessible connections for compliance with manufacturer's torque tightening specifications.
- B. Prior to energization, check circuitry for electrical continuity and for short-circuits. After all wiring is pulled and ready for operation but prior to placing systems in service, conduct insulation resistance tests in all feeder circuits. Measure the insulation resistance between conductors and between each conductor and ground. Make measurements with an instrument capable of making measurements at an applied potential of 500 Volts.
- C. Upon completion of installation of transformers, energize primary circuitry at rated voltage and frequency from normal power source and test transformers, including but not limited to audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units or components and proceed with retesting.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days from Final Acceptance, perform an infrared scan of each transformer.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies transformer checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Extent of panelboard, load center, and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules.
- B. Refer to other Division 26 Sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures; not work of this Section.

1.03 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with the NEC requirements pertaining to installation of wiring and equipment in hazardous locations.
- B. Comply with applicable requirements of UL 67, "Electric Panelboards," and UL 50, UL 869, UL 486A, UL 486B, and UL 1053 pertaining to panelboards, accessories, and enclosures. Provide units which are UL-Listed and labeled.
- C. Comply with NEMA 250, "Enclosures for Electrical Equipment (1,000 Volts Maximum)," and NEMA PB1, "Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less."

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Except as otherwise indicated, provide panelboards, enclosures, and ancillary components of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with the NEC, UL, and established industry standards for those applications indicated. Series rating is not acceptable for circuit breakers serving life safety equipment.
- B. Provide dead-front, safety-type, power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and arrangement shown; with mechanical type conductor connectors for Main, Neutral, and Ground lugs approve for copper or aluminum conductors. Specific circuit breaker placement is required in panelboards to match the circuit breaker placement indicated in the panelboard schedule on the drawings. Equip with copper busbars with not less than 98% conductivity and with neutral bus. Provide all 208Y/120 volt panelboards served by K4 rated transformers with 200% neutral bus. Provide suitable lugs on neutral bus for outgoing circuits requiring neutral connections. Provide bolt-on molded-case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole circuit breakers are indicated, provide with common trip so an overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards. Branch mounted main circuit breakers are not acceptable. Provide bottom mounted main circuit breakers for panelboards fed from below. Provide top mounted main circuit breakers for panelboards fed

from above. All spaces shall have bus fully extended and drilled for the future installation of breakers.

- C. Provide galvanized sheet-steel cabinet-type enclosures, in sizes and NEMA types as indicated, code gauge, minimum 16-gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys. All panelboard enclosures shall be keyed alike. Equip with interior circuit directory frame and card with clear plastic covering. Provide baked gray enamel finish over a rust-inhibitor coating. Design enclosures for flush mounting unless otherwise indicated. Provide enclosures which mate properly with panelboards to be enclosed.
- D. Provide panelboard accessories and devices, including but not necessarily limited to circuit breakers and ground-fault protection units, as recommended by panelboard manufacturer for ratings and applications indicated. Provide electronic trip circuit breakers with adjustable trip settings for all life-safety emergency power feeders. Circuit breakers serving permanently connected appliances rated over 300 volt-amperes shall be provided with permanent lock-out devices. Circuit breakers serving surge protective devices “SPD” shall be located close to the equipment main circuit breaker or main lugs whether indicated or not. Provide HACR rated circuit breakers for all heating and air conditioning equipment. Provide GFCI circuit breakers where indicated. GFCI circuit breakers shall be Class A ground-fault protection (5-mA trip). Provide GFEP circuit breakers where indicated. GFEP circuit breakers shall be Class B ground-fault protection (30-mA trip). Circuit breakers serving heat trace and ice melting equipment shall be provided with a permanent lockout device
- E. Provide panelboards with weatherproof NEMA 3R enclosures with air flow, whether indicated or not, when installed outdoors.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which panelboards and enclosures are to be installed, and notify the General Contractor, in writing, of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install panelboards and enclosures as indicated, in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA “Standard of Installation,” and in compliance with recognized industry practices to ensure that products fulfill requirements.
- C. Coordinate installation of panelboards and enclosures with raceway installation work.
- D. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
- E. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
- F. Provide properly wired electrical connections within enclosures.
- G. Provide a typed circuit index card for each panelboard upon completion of installation work. Indicate load served and room number(s). Use final room numbers obtained from the Architect or Owner, not construction room numbers as shown on the drawings.

3.02 GROUNDING

- A. Provide equipment grounding connections for all panelboards. Tighten connections to comply with tightening torques specified in UL 486A and UL 486B to assure permanent and effective grounding.

3.03 FIELD QUALITY CONTROL

- A. Keep panelboards clean and free from foreign matter of any kind, before, during, and after installation.
- B. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- C. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- D. Prior to energization, check panelboards for electrical continuity of circuits and for short-circuits.
- E. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.
- F. Infrared Scanning: After Substantial Completion, but not more than 60 days from Final Acceptance, perform an infrared scan of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.04 GROUND FAULT EQUIPMENT TESTING

- A. Ground fault equipment provided with panelboards shall be tested when first installed on the site in accordance with the requirements of NEC Article 230.95.
- B. A written record of the test shall be made available to the authority having jurisdiction.

END OF SECTION

SECTION 262420
MOTORS AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. Furnish and install disconnect switches as indicated on the drawings and specified herein.
- B. Provide all power wiring, disconnect switches and electrical connections to all equipment provided and requiring electrical connections. Starters and/or magnetic contactors; including Variable Frequency Drives ("VFD") for HVAC equipment that is not integral with the HVAC equipment; shall be furnished by Division 23 Contractor, installed where and as indicated on the electrical drawings by the Electrical Contractor and provided with power wiring by the Electrical Contractor unless otherwise indicated. Power wiring between magnetic contactors and the final connection point on the HVAC equipment shall be provided under Division 26. Division 23 Contractor shall provide the proper number and size of auxiliary contacts in the magnetic contactors required for the proper operation and control of the HVAC equipment.
- C. All control wiring and conduits between control instruments and the magnetic contactor or VFD serving a piece of mechanical equipment shall be provided by Division 23 Contractor and installed in accordance with the requirements of Division 26, unless otherwise indicated on the electrical drawings or in the electrical specifications.
- D. Review the mechanical drawings and specification sections for exhaust fans requiring control by wall switch, solid state speed controller, or line voltage thermostat and provide same where indicated on the electrical drawings.

PART 2 - PRODUCTS

2.01 DISCONNECT SWITCHES

- A. Disconnect switches shall be rated for the voltage of the equipment being served with number of poles and current rating as indicated. Disconnect switches shall be non-fusible or fusible type as indicated on the drawings.
- B. Switches shall be NEMA standard Heavy Duty type.
- C. Switches shall be horsepower rated when used for motor disconnect means.
- D. Provide fused disconnect switches complete with appropriately sized fuses for the circuits controlled.

2.02 MOTOR RATED SWITCHES

- A. Motor rated switches shall be rated for the voltage of the equipment being served with number of poles and current rating as indicated.
- B. Motor rated switches shall be UL listed, suitable as motor disconnect, and industrial grade.
- C. Motor rated switches shall be horsepower rated when used for motor disconnect means.

PART 3 - EXECUTION

3.01 INSTALLATION OF DISCONNECT SWITCHES

- A. Examine area and conditions under which electrical connections for equipment are to be installed. Notify the General Contractor; in writing; of conditions detrimental to proper

completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

- B. Coordinate locations of disconnect switches with the locations of mechanical equipment, piping, electrical equipment and any and all other building elements such that all NEC requirements, including working clearances, are met. Adjust locations from those shown on the drawings as required to comply with NEC working clearance requirements at no additional cost to the project.
- C. Secure disconnects switches to building elements or equipment housings where indicated on the drawings. Where building walls or equipment housings do not provide suitable mounting surfaces, provide a galvanized unistrut frame or rack satisfactory in size to securely support the disconnect switch, magnetic contactor and /or VFD. Where racks are required to be roof mounted, secure the rack to the roof in a method that does not compromise the roof membrane in any way. Submit the roof attachment method to the Architect/Owner for approval prior to construction or installation.

3.02 ELECTRICAL CONNECTIONS TO EQUIPMENT

- A. Provide electrical connections to equipment indicated in accordance with equipment manufacturer's published instructions and recognized industry practices. Comply with applicable requirements of UL, the NEC and the NECA "Standard of Installation," to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceway and equipment installation as necessary to properly interface installation of electrical connections to equipment with other work.
- C. Connect electrical power supply conductors to equipment in accordance with equipment manufacturer's published instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- D. The contractor shall coordinate the following electrical requirements for all mechanical equipment with the Division 23 Contractor:
 - 1. Number of electrical connections.
 - 2. Number and size of feeders' terminal lugs.
 - 3. Maximum overcurrent protection.
 - 4. Size and type of fuses.
- E. Cover splices with electrical insulating material equivalent to or greater than the electrical insulation rating of the conductors being spliced.
- F. Prepare cables and wires by cutting and stripping covering, armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Avoid "ringing" conductors while skinning wire.
- G. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- H. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL 486A.
- I. Provide flexible steel conduit for motor connections and other electrical equipment connections where subject to movement and vibration.

- J. Provide liquid-tight flexible steel conduit for connection of motors and other electrical equipment where subject to movement and vibration and where connections are located where subject to any of the following conditions:
 - 1. All exterior locations
 - 2. Moist or humid atmosphere where condensation can be expected to accumulate (Example: sump pump and elevator pits)
 - 3. Corrosive atmosphere (Example: battery charging rooms)
 - 4. Water spray
 - 5. Dripping oil, grease, or water
 - 6. Kitchens and Sculleries

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

3.04 GROUND FAULT EQUIPMENT TESTING

- A. Ground fault equipment provided with motor control centers shall be tested when first installed on the site in accordance with the requirements of NEC Article 230.95.
- B. A written record of the test shall be made available to the authority having jurisdiction.

END OF SECTION

SECTION 262726
WIRING DEVICES AND DEVICE PLATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 SCOPE OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of the electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this Section include the following:
 - Receptacles
 - Ground-fault circuit interrupters
 - Switches
 - Cover plates
 - Wall Plate-type Dimmer Switches
 - Plugs and Connectors
- C. Comply with the requirements of the NEC, as applicable to installation and wiring of electrical wiring devices.
- D. Comply with applicable requirements of UL 20, 486A, 498, 943, and 1472 pertaining to installation of wiring devices. Provide wiring devices which are UL-Listed and labeled.
- E. Comply with applicable portions of NEMA WD1, "General-purpose Wiring Devices, and WD5, "Wiring Devices, Specific Purposes."

PART 2 - PRODUCTS

2.01 FABRICATED WIRING DEVICES

- A. Provide factory-fabricated wiring devices in types and electrical ratings for applications indicated and which comply with NEMA WD1. Provide white, colored-devices, except as otherwise indicated.

2.02 RECEPTACLES

- A. Duplex: Provide Industrial/Institutional, Specification-Grade, Tamper Resistant TR duplex receptacles, 2-pole, 3-wire, grounding, with green hexagonal equipment ground screw, single-piece brass mounting yoke with integral ground terminals, 20 amperes, 125 Volts, with metal plaster ears; designed for side and back wiring, with NEMA configuration 5-20R, unless otherwise indicated. LEVITON 5362, Tamper Resistant TR Series, or approved equal.
- B. Ground-fault Circuit Interrupters: Provide Industrial/Institutional, Specification-Grade, Tamper Resistant TR, "feed-thru"-type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 120 Volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 mA ground-fault trip level; equipped with NEMA configuration 5-20R. LEVITON model 7899, Tamper Resistant TR Series, or approved equal.
- C. Ground-fault Weather Resistant Circuit Interrupters; Provide Industrial/Institutional, Specification-Grade, Tamper Resistant TR, "feed-thru"-type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 125 Volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 mA ground-fault trip level;

equipped with NEMA configuration 5-20R. LEVITON model WR899-W, Tamper Resistant TR or approved equal.

2.03 SWITCHES

- A. Snap: Provide Specification-Grade, flush, single-pole toggle switches, 20 amperes, 120/277 Volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, equipment grounding screw, and side-wired screw terminals. LEVITON 1221-2 Series, or approved equal. Provide for key operation where indicated on drawings.
- B. Three Way: Provide Specification-Grade, flush, 3-way switches, 20 amperes, 120/277 Volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, equipment grounding screw, side-wired screw terminals, with break-off tab features, which allow wiring with separate or common feed. LEVITON 1223-2 Series, or approved equal. Provide for key operation where indicated on drawings.
- C. Four Way: Provide Specification-Grade, flush, 4-way quiet switches, 20 amperes, 120/277 Volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, equipment grounding screw, side-wired screw terminals, with break-off tab features, which allow wiring with separate or common feed. LEVITON 1224-2 Series, or approved equal. Provide for key operation where indicated on drawings.
- D. LED Dimmers: Provide 120/277 volts AC, 60Hz, Single pole and 3-Way, 0-10VDC, LED power Supply Dimmer controls for LED light fixtures; wattage as indicated, with continuously adjustable slide dimmer, ON/OFF button, and equipped with electromagnetic filters to eliminate noise, RF and TV interference.

2.04 WIRING DEVICE ACCESSORIES

- A. Cover plates: Provide mid-size (JR Jumbo) white cover plates for single and combination wiring devices of types and with ganging and cutouts as required. Provide metal screws for securing plates to devices; screw heads colored to match color of plates. Provide stainless-steel cover plates in mechanical and electrical equipment rooms. Provide all receptacles connected to emergency circuits with red color coverplates.
- B. Provide "metal extra duty weatherproof-while-in-use" rated cover plates for receptacles installed outdoors where exposed to weather.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRING DEVICES

- A. Install wiring devices where indicated in Contract Documents in accordance with manufacturer's published instructions, applicable requirements of the NEC and NECA "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt, and debris.
- D. Install wiring devices after wiring work is completed.
- E. Install cover plates after painting work is completed. Label the inside face of each cover plate with indelible black marker indicating the number of each circuit contained in or running through the outlet box.
- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with

tightening torques specified in UL 486A and UL 486B. Use properly scaled torque indicating hand tool.

- G. Terminate all switch and receptacle wiring on side screw terminals. Back terminations are not permitted.
- H. Install all switches and receptacles with sufficient wiring length such that the device may be extracted from the outlet box a minimum of 6" while still connected.
- I. Install grounded conductors at the location of switches per the requirements of NEC Article 404.
- J. Switches that are combined in the same enclosure that exceed 300 volts are prohibited.
- K. Receptacle that are used during construction after permanent power is energized shall be replaced at the final completion of the project.

3.02 PROTECTION OF COVER PLATES AND RECEPTACLES

- A. Upon installation of cover plates and receptacles, take caution regarding use of convenience outlets. At time of Substantial Completion, replace all cover plates and receptacles which have been damaged; during the execution of this project; including those painted over, burned, or scored by faulty plugs.

3.03 GROUNDING

- A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.

3.04 TESTING

- A. Prior to energizing circuitry, test wiring for electrical continuity and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements. The proper outlet testing equipment shall be used to test receptacles.

END OF SECTION

SECTION 264313
SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings.

1.02 RELATED SECTIONS

- A. Section 262416 – Panelboards

1.03 REFERENCES

- A. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 Latest Edition).

1.04 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 - 1. Provide verification that the SPD complies with the required ANSI/UL 1449 Latest Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I_n).
 - 2. Electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.
- B. Where applicable the following additional information shall be submitted to the engineer:
 - 1. Descriptive bulletins
 - 2. Product sheets

1.05 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.07 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 - PRODUCTS

2.01 VOLTAGE SURGE SUPPRESSION – GENERAL

- A. Electrical Requirements:

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

Configuration	Protection Modes			
	L-N	L-G	L-L	N-G
Wye	•	•	•	•
Delta	N/A	•	•	N/A
Single Split Phase	•	•	•	•
High Leg Delta	•	•	•	•

5. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.
6. ANSI/UL 1449 Latest Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 Latest Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277
L-L	1200	2000
L-N	800	1200
L-G	800	1200
N-G	700	1200

- B. SPD Design:

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge

suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
 - a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
 - 1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
 - 2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
 - 3) The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.
 - b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
 - c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
 - d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of $50 \pm 20A$ occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.
 - 1) The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection:

The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements:

The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

- a. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.
- b. SPDs shall be factory sealed in order to prevent access to the inside of the unit. SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

2.02 SYSTEM APPLICATION

- A. The SPD applications covered under this section include distribution and branch panel locations and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.
- B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum Surge Current Capacity Based on ANSI / IEEE C62.41 Location Category			
Category	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Main Service Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards)	120 kA	60 kA

- C. SPD Type – SPDs installed on the load side of the service entrance disconnect shall be Type or Type 2 SPDs.
- D. Service entrance SPD shall be connected to a 60 amp, 3 pole circuit breaker.
- E. Branch panelboards SPD's shall be connected to 30 amp, 3 pole circuit breakers.

2.03 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

- A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.
 - 1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
 - 2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
 - 3. The panelboard shall be capable of re-energizing upon removal of the SPD.
 - 4. The SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
- B. Side mount Mounting Applications Installation (SPD mounted external to electrical assembly):
 - 1. Lead length between the breaker and suppressor shall be kept as short as possible to ensure optimum performance. Any excess conductor length shall be trimmed in order to minimize let-through voltage. The installer shall comply with the manufacturer's recommended installation and wiring practices.

2.04 ENCLOSURES

- A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:
 - 1. NEMA 1 – Constructed of steel intended for indoor use to provide a degree of protection to personal access to hazardous parts and provide a degree of protection against the ingress of solid foreign objects.
 - 2. NEMA 4 – Constructed of steel intended for either indoor or outdoor use to provide a degree of protection against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (dirt and windblown dust); to provide a degree of protection with respect to the harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.
 - 3. NEMA 4X – Constructed of stainless steel providing the same level of protection as the NEMA 4 enclosure with the addition of corrosion protection.

PART 3 - EXECUTION

3.01 FACTORY TESTING

- A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.02 INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.03 WARRANTY

- A. The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION

SECTION 265100
INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Section 260100, "Electrical General Provisions," apply to this Section.

1.02 DEFINITIONS

BF:	Driver factor.
CCT:	Correlated color temperature
THD:	Total Harmonic Distortion
CRI:	Color-rendering index.
CU:	Coefficient of utilization.
RCR:	Room cavity ratio.
L70:	Minimum 70% maintained initial-rated lumens at average rated life for LEDs.
IESNA:	Illuminating Engineering Society of North America
LM-80:	IESNA approved method of measuring Lumen Depreciation of LED Light Sources
LED:	Light Emitting Diode
UL:	Underwriter Laboratories

1.03 SCOPE OF WORK

- A. Extent of interior light fixture work is indicated by drawings and schedules.
- B. Light fixtures shown installed on exterior walls or under canopies attached to the building are considered interior building lighting.
- C. Types of interior light fixtures in this Section include the following:

Light-emitting Diode

1.04 QUALITY ASSURANCE

- A. Comply with the requirements of the NEC, as applicable to installation and construction of interior building light fixtures.
- B. Provide interior light fixtures which are UL-Listed and labeled.
- C. Provide LED drivers which comply with NEMA SSL-1, "Electronic Drivers for LED Devices, Arrays, or Systems", and SSL-3, "High Power White LED Binning for General Illumination".

PART 2 - PRODUCTS

2.01 INTERIOR LIGHT FIXTURES

- A. Provide light fixtures of sizes, types, and ratings indicated; complete with, but not limited to, housings, reflectors, LED module, LED drivers and wiring. Provide fixture trims as required for proper installation into the type ceiling in which installed. Review Architectural reflected ceiling

plans for ceiling types and construction and provide all mounting hardware required for proper installation of the fixtures specified for the location.

- B. Air-Handling Fixtures: Fixtures used as air-handling registers shall meet requirements of NFPA.

2.02 LED LIGHT FIXTURES

- A. LED fixtures shall be in compliance with UL.
- B. Interior Area LED Fixtures:
1. Kelvin temperature of interior fixtures as indicated on drawings.
 2. Minimum of 75 plus lumens per watt.
 3. CRI 80 or greater.
 4. 5-year warranty minimum with L70 of 50,000 hours or greater.
 5. Modular design for field replacement of parts.
 6. Tool less access to driver and LED modules.
 7. Cannot have LED pixilation (or commonly called bug eye effect).
 8. UL certified up to 90F degrees operating temperature.
- C. Manufactured by one of the following:
1. Nichia Corporation.
 2. Cree, Inc.
 3. Philips LumiLED.
 4. Osram Opto Semiconductors.
 5. Cooper Industries.
 6. Lusio Lighting.
 7. Sony.
 8. Citizens Electronics

2.03 RECESS- AND FLUSH-MOUNTED FIXTURES

- A. Provide light fixture types which can be relamped from the bottom. Access to driver shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as required for the ceiling construction in which it is installed.

2.04 SUSPENDED FIXTURES

- A. Provide hangers capable of supporting twice the weight of the fixture supported by the hanger. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size required. Hangers shall be shock-absorbing type where indicated. Hangers shall allow fixtures to swing within an angle of 20 degrees. Multiple-unit or continuous row fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end, unless indicated otherwise. Rods shall be a minimum .18" diameter.

2.05 EXIT LIGHTS

- A. Exit lights shall be in conformance with UL and NFPA. Exit lights shall be self-powered type where indicated.
- B. Self-Powered LED-Type Exit lights (Battery Backup): Provide with automatic power failure device, test switch, pilot light and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no

maintenance, including no additional water, for a period of not less than 5 years. LED exit lights shall have emergency run time of 1.5 hours (90 minutes) minimum.

2.06 EMERGENCY LIGHTING EQUIPMENT

- A. Equipment shall be in conformance with UL and NFPA. Provide lamps in wattage indicated.
- B. LED Emergency Driver: Each unit shall consist of an automatic power failure device, test switch operable from outside of the fixture, pilot light visible from outside the fixture, and fully automatic solid-state charger in a self-contained power pack. Charger shall be either trickle, float, constant-current or constant-potential type, or a combination of these. Battery shall be sealed electrolyte type with capacity as required to supply power to two LED circuit boards for 90 minutes at a minimum of 800 lumens output power. Battery shall operate unattended and require no maintenance for a period of not less than 5 years.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install interior light fixtures at locations and heights as indicated in accordance with fixture manufacturer's published instructions, applicable requirements of the NEC, NECA "Standard of Installation," NEMA standards, and with recognized industry practices to ensure that light fixtures fulfill requirements.
- B. Coordinate with all other work on this Contract as appropriate to properly interface installation of interior light fixtures.
- C. Fasten fixtures securely to building structural members, and check to ensure that solid pendant fixtures are plumb. Recessed fixtures shall be supported with individual annealed, light zinc-coated finish, 12-gauge wire from all four corners tied to building structural members. Securing safety wires to bridging is not acceptable. The supporting wires shall be distinguishable by color or tagging.
- D. Clean interior light fixtures of dirt and debris (including lenses) upon completion of installation.
- E. Protect installed fixtures from damage during entire construction period.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of interior light fixtures and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

3.03 GROUNDING

- A. Provide tight equipment grounding connections for each interior light fixture installation.

END OF SECTION