

**REPLACEMENT FACILITY FOR
ROCK CREEK SCHOOL**

55B West Frederick Street
Walkersville, Maryland 21793

Bid Set
July 1, 2019

VOLUME 2

Project No: 17-22
FCPS Bid #19C14



BID SET SPECIFICATIONS

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New Facility for
Rock Creek School
Frederick County Public Schools
55B West Frederick St.
Walkersville, Maryland 21793

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SUMMARY OF WORK

PART 1 – GENERAL

1.1 SUMMARY OF WORK

- A. Project Name: Rock Creek School, Walkersville, Maryland
- B. Owner's Name: Frederick County Public Schools (FCPS)
- C. Contract Type: The project is utilizing a Construction Management – Agency delivery method, which will result in multiple prime contracts, each based upon a stipulated price.
- D. Project Overview: This project includes construction of a new special needs school facility on a previously developed site. Furnish all labor, materials, equipment, and services necessary for and incidental to the selective demolition of portions of the existing site features, including full demolition of an existing pre-engineered metal storage shed, and construction of a new school and associated site amenities for the Rock Creek School. Work includes rerouting of and connection to existing utilities as indicated on the Civil and Mechanical, Plumbing, Electrical, and Telecommunications drawings. All work shall be bid as lump sum as indicated on the drawings and specifications. Add alternates are included. Work shall be coordinated with the Owner and completed in the time frame dictated by the Owner. Work is further described as follows:
 - 1. Site Summary: The site is home to the existing Walkersville Middle School. The Middle School will remain operational during construction of the new Rock Creek School and will continue to operate as a Middle School after this project is complete. Improvements to the existing school's site, including reworking of the bus loop, drop-off loop, parking areas, and outdoor athletic facilities are included in the scope of this project. Demolition of a portion of an existing masonry screen wall that is attached to the existing school will be required in order to construct the new site improvements. Minimal work will be required within the Middle School for connection to its existing fiber optic network. Work within the school must be coordinated to avoid disruption to the Middle School operations and shall be completed when students are not in the building.
 - 2. The Owner will be occupying the entire existing Middle School building, following a normal school schedule for the 2019/2020, and 2020/2021 school years. It is imperative that all Contractors understand the access, operational, safety and utility requirements of the Owner during the occupied periods. All work located on the interior and exterior of the building, and/or affecting occupied areas shall be completed at no disturbance to students or FCPS staff and teachers. All utility outages shall be coordinated with the Owner, and occur during unoccupied periods. Sitework will be phased in order to allow for continued operations in the existing school during construction.
 - 3. During the school's summer break, occupancy of the existing school will be limited to 12-month Administrative Staff. There will also be a basketball camp for middle school aged students hosted on-site in the existing gym and outdoor basketball court areas from early June until late July 2020.
 - 4. During the occupied school year, NO deliveries to the building or large pieces of equipment will be permitted to enter or exit the site during the following periods of time during the day (Monday thru Friday): 7:00 – 8:30 am and 2:15 – 3:45 pm. All deliveries and construction traffic must be coordinated with school activities and use.

5. The Owner intends to occupy the new facility upon Substantial Completion of construction. All remaining work must be coordinated with occupancy and must be conducted in a manner so as to minimize impact to and disturbance of occupants.
6. New Work: is indicated on the contract documents and includes civil, landscape, architectural, structural, mechanical, plumbing, and electrical work.
 - a. The new facility is single story slab-on-grade construction. The structural system is a combination of steel frame and masonry bearing walls with steel roof joists and deck. The building includes administrative areas, general classrooms, specials classrooms, a Library, a Dining area with Kitchen, a Gymnasium, a Therapy pool, locker rooms, restrooms, and support spaces.
 - b. Architectural work includes, but is not limited to, the new building envelope, new interior walls and partitions, new doors, frames, and hardware, new windows, storefront, and curtainwall, new toilet compartments and accessories, new lockers, new display boards and specialties, new medical equipment, new appliances, and new finish systems.
 - c. Full mechanical, electrical, and plumbing systems are provided, including sprinkler systems, fire alarm, and telecommunications systems.
7. The project is required to achieve Leadership in Energy and Environmental Design (LEED) for Schools version 4 certification at the Silver level. Specific requirements for certification are outlined in the contract documents. Contractors shall be responsible for complying with LEED certification requirements and for providing required LEED submittal documentation. Contractors may also be required to assist in completing LEED Online credit forms as required for certification.
8. Mechanical, Electrical, and Plumbing Systems Commissioning and Building Envelope Commissioning are both included in the scope of work for this project. The commissioning agents have been hired by Frederick County Public Schools. Contractors are required to coordinate with the commissioning agents to facilitate all testing and inspection required as part of the commissioning process.

E. Work to be completed by Frederick County Public Schools:

1. Loose Furniture: FCPS's vendor will supply and install all loose furnishings unless otherwise noted.
2. Telecommunications and Security equipment: Wireless access points and wireless controllers will be provided by Frederick County Public Schools for installation by the appropriate trade contractor. The following equipment will be purchased and installed by Frederick County Public Schools:
 - a. WAN Router
 - b. Data Switches
 - c. Servers and Monitors
 - d. Network servers and software
 - e. VoIP servers and handsets
 - f. Intercom and Master Clock headend equipment

- g. Surveillance cameras, DVRs, switches, programming, and workstations. Provision and installation of structured cabling for all security components is included in the trade contractor's scope of work.
- F. Provide proper insurance as required by the general conditions; local state, and national building regulations; and authorities having jurisdiction to adequately protect persons and property.

1.2 LOCAL CONDITIONS

- A. All contractors shall check, measure, and verify all site conditions and be responsible for familiarizing themselves with the nature, extent and quantity of the work. Where drawings or specifications conflict with the unforeseen existing field conditions, Contractors shall notify the Construction Manager. The Architect or Owner will then give written directions and/or clarifications on how to proceed.
- B. The contractor shall carefully examine the bidding documents, inspect the site, acquaint themselves with all governing laws and codes, and familiarize themselves with all matters affecting the work. Any items not questioned during the pricing period shall be provided as required, complete in all respects.
- C. Contractors are responsible for verification of all utility locations and the repair of them if damaged due to construction. Contractors shall restore to the original condition all damages due to construction.
- D. Notify parties owning utilities which are not part of this scope of work and will interfere with the execution of the work to remove or relocate them. In the event that the costs of such removals or relocations are not borne by these parties, such cost shall be paid by the owner.

1.3 SPECIAL CONDITIONS

- A. Asbestos: It is not anticipated that asbestos will be encountered in the project.
- B. Lead: It is not anticipated that lead will be encountered in the project.
- C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- D. Use adequate but reasonable precautions to prevent the spread of dust, dirt, and noise to adjacent areas.
 - 1. Provide methods of preventing spread of dust, dirt, and noise to the Owner and Construction Manager for review.

1.4 REGULATORY REQUIREMENTS

- A. The following regulations are applicable to this project:
 - 1. Applicable local codes and ordinances including Town of Walkersville and Frederick County codes, ordinances, and regulations.
 - International Building Code, 2015 edition
 - Code of Maryland Regulations 05-02-02 (Maryland Accessibility Code) and ADAAG 2010

- International Mechanical Code, 2015 Edition
- Plumbing and Gas: International Plumbing Code, 2015 Edition
- Energy: International Energy Conservation Code, 2015 Edition
- Governing fire department requirements
- Utility company requirements
- County, State and Federal Safety and Health Laws
- State of Maryland Fire Prevention Code, 2013 Edition
- National Fire Protection Association (NFPA) Standards:
- NFPA 101 Life Safety Code, 2015 Edition
- NFPA 70 - National Electrical Code (NEC), 2014 Edition
- ASHRAE 90.1, 2013 Edition

B. Other regulations may also be applicable.

C. Obtain copies of the regulations listed above and keep at the project site for the use of all parties.

1. Submit copies of all permits, licenses and similar permissions obtained to the Owner directly.

1.5 PERMITS AND INSPECTIONS

- A. Required site permits and a general building permit are in the process of being obtained for this project. Trade contractors shall obtain and pay for all remaining trade permits and inspection fees required for all local, state or federal applicable codes.
- B. The Construction Manager shall supply the Owner with a copy of all permits and inspection reports.

- END OF SECTION 01 11 00 -

SECTION 01 19 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Commissioning requirements common to all Sections.
- B. Systems and equipment startup and documentation.
- C. Validation of proper and thorough installation of systems and equipment.
- D. Development and execution of pre-FPT checklists.
- E. Performance Verification Testing.
- F. Functional Performance Testing.
- G. Documentation of tests, procedures, and installations.
- H. Coordination and requirements of training events.
- I. Management of Record Construction Documentation.
- J. Sequencing.
- K. LEED Requirements

1.2 GENERAL DESCRIPTION

- A. Commissioning (Cx) is the process of ensuring that all building systems are installed and perform interactively according to the design intent; that systems are efficient and cost effective and meet the Owner's operational needs; that the installation is adequately documented; and that the Operators are adequately trained. It serves as a tool to minimize post-occupancy operational problems. It establishes testing and communication protocols in an effort to advance the building systems from installation to full dynamic operation and optimization.
- B. Commissioning Authority shall work with the Contractors, the CM and the Design Team to direct and oversee the Cx process.
- C. The Commissioning Plan outlines the commissioning process beyond the Construction Documents. The specification sections dictate all requirements of the commissioning process relative to the construction contract. The Cx Plan is available for reference at the request of the Contractor; however, it is not part of the construction contract.
- D. This Section and other Sections of the specification detail the Contractor's responsibilities relative to the Cx process.

1.3 SCOPE

- A. This Section covers elements, requirements, procedures, and protocols common across all Divisions of the work. Requirements specific to individual Sections are specified in the technical specification as well as a dedicated Section for Divisions 23, namely "23 08 00 - Mechanical System Commissioning" and "23 08 59 – Instrumentation and Control System Commissioning."
- B. The following sections include building commissioning activities and documentation in support of the U.S. Green Building Council (USGBC) LEED™ rating program:
 - 1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" prerequisite of "Fundamental Commissioning and Verification."
 - 2. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" credit for "Enhanced Commissioning."
- C. Specific systems to be commissioned are indicated in the following Divisions of the Specification:

1. Division 23 - Mechanical: Requirements for commissioning are specified in Section 23 08 00 as well as in individual Division 23 Sections.
2. Building Automation Systems (BAS): Requirements for commissioning are specified in Section 23 08 59.
3. Electrical Systems: Requirements for commissioning are specified in Section 26 08 00

1.4 RELATED WORK AND DOCUMENTS

- A. Commissioning Plan (Cx Plan): The Cx Plan shall be available for reference as it outlines responsibilities outside of the Construction Contract. It gives the Contractor a perspective as to the overall process. It encompasses the entire commissioning process including design phase and post-construction tasks.
- B. Section 01 40 00 – Quality Control: Specifies the contractor's requirements and responsibilities for testing and re-testing.
- C. Section 01 33 00 – Submittals: Addresses documentation and procedures relative to the commissioning process, including Operation and Maintenance Manuals.
- D. Section 01 50 00 – Temporary Utilities: Specifies the requirements for using Owner's existing and/or permanent equipment and controls for temporary conditioning in the facility.
- E. Section 01 77 00 – Project Close Out: Defines the milestones in completion incorporating the commissioning process.
- F. Section 01 81 13 – Sustainable Design Requirements: Provides LEED™ requirements for the project delivery.
- G. Section 01 91 15 – Functional Performance Testing Procedures: Provides 'generic' functional performance testing procedures to illustrate the level-of-effort expected during acceptance testing.
- H. Individual Specification Sections: Individual sections stipulate installation, startup, warranty, O&M documentation, and training requirements for the system or device specified in the Section.
- I. Section 23 08 59 – Instrumentation and Control Systems Commissioning: Details the commissioning procedures specific to the EMS/ATC Systems.
- J. Section 23 08 00 – Mechanical Systems Commissioning: Details the commissioning procedures specific to Division 23 work.

1.5 DEFINITIONS AND ABBREVIATIONS

- A. Acceptance Phase: This is the phase of the project when the facility and its systems and equipment are inspected, tested, verified, and documented; and when most of the Performance Verification and Functional Performance Testing and some final training occurs. The Acceptance Phase requires certification by the contractor that the systems have been started up in accordance with the approved protocols and the submission of the documentation of that startup, and completion of Pre-FPT checklists. The Acceptance Phase ends with either (the successful completion of all functional performance testing and sign off by the CA.
- B. A/E: General reference to the Architect/Engineer lead-design entity.
- C. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers.
- D. Automatic Temperature Controls Contractor (ATC): Contractor responsible for providing the Building Automation System and automatic temperature controls specified in Section 23 09 00.
- E. Basis of Design (BoD) Document: The Basis of Design document is prepared by the Engineer of Record and shall respond to, and be consistent with, the performance criteria specified in the Owner's Project Requirements (OPR). The BoD illustrates the means by which OPR criteria are to be achieved, documenting the assumptions and parameters used in the design, and documenting the primary thought processes or decisions made that

- resulted in the selected alternatives. At the end of the project, the final BoD will be incorporated into the Systems Manual in part or in its entirety.
- F. The BAS (or FMS) references below are 2 common ways to reference the building automation or DDC control system. Edit definitions and references throughout this document accordingly if the client has a preferred way to designate these systems.
 - G. Building Automation Contractor (BAC): Contractor responsible for work in section 23 09 00. Also referred to as ATC Contractor.
 - H. Building Automation System (BAS): Computer-based control or automation system. May also be referred to as the EMS.
 - I. Commissioning (Cx): The process of ensuring that all building systems perform interactively according to the design intent, that systems are efficient and cost effective and meet the Owner's operational needs.
 - J. Commissioning Authority (CA): The Party retained by the Owner who will oversee the commissioning process, develop and stipulate many of the commissioning requirements, manage the commissioning process, and ensure and validate that systems and equipment are designed, installed and tested to meet the Owner's requirements.
 - K. Commissioning Coordinator (Cx/C): This refers to the Individual within each of the various Parties that is designated the Point-Of-Contact for that Party relative to commissioning activities.
 - L. Commissioning Portal: This is an internet hub for the sharing of commissioning information. This portal will act as a hub for posting electronic information.
 - M. Commissioning Specifications (Cx Specs): Includes separate commissioning specification sections and commissioning-related subsections of other specifications. All Contractor requirements relating to commissioning should be conveyed within the Cx Specs. Commissioning Specs should be referenced but not duplicated within the Commissioning Plan (which is designed to govern non-Contractor-related issues).
 - N. Commissioning Team (CxT): Consists of the parties involved in the commissioning process for all systems to be commissioned. The Commissioning Team will include a core group involved with all systems. This core group will typically include the Commissioning Authority, the Owner's Commissioning Coordinator, and the Construction Manager's Commissioning Coordinator. On any given system, the Commissioning Team will also include the Commissioning Coordinator for the contractor(s) responsible for the system or equipment.
 - O. Contractor: 'Contractor' is a general reference to the Installing Party and can therefore refer to the Construction Manager, subcontractors, or vendors as inferred by its usage.
 - P. Construction Manager (CM): The party acting as the primary coordinator of all the prime contractors (Mechanical Contractor, Electrical Contractor, etc.).
 - Q. Construction Phase: Phase of the project during which the facility is constructed and/or systems and equipment are installed and started. Contractor and subcontractors complete the installation, startup, startup documentation, Pre-FPTs, submit O&M information, establish trends, and perform any other applicable requirements to get systems started. Contractors and Vendors may also conduct equipment specific training. The Construction Phase will typically end upon completed startup and TAB of systems and equipment.
 - R. Contract Documents: The documents governing the responsibilities and relationships between parties involved in the design and construction of the project including (but not necessarily limited to):
 - S. Contracts: A legally binding agreement reached between two parties.
 - T. Construction Plans and Drawings: A set of drawings that define the scope of the project.
 - U. Specifications: Define the exact requirements of the project, products and processes.
 - V. Addenda: Document or information attached or added to clarify, modify or support the information in the original document or written work.
 - W. Change Orders: Work that is added or removed from the original scope of work.

- X. Commissioning Plan: The master planning, management and communications tool related to commissioning, setting out scope, standards, roles and responsibilities, expectations, deliverables, etc., and is addressed to all members of the Commissioning Team.
- Y. Construction Documents: Refers to the Contract Documents that dictate the details of the installation.
- Z. Deficiency: A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).
- AA. Owner's Project Requirements (OPR): The OPR defines the benchmark by which the success of the project is ultimately judged. It provides a detailed explanation of the ideas, concepts, and criteria that are deemed by the Owner to be important. The Basis of Design prepared by the Engineer of Record articulates how the requirements of the OPR will be met in the design. At the end of the project, the final OPR will be incorporated into the Systems Manual.
- BB. Electrical Contractor (EC): Contractor responsible for Division 26 work
- CC. Energy Management System (EMS): Alternate reference to the computer-based control or automation system. May also be referred to as the BAS.
- DD. Exception Records: Any issue that requires a response, completion, corrective or additional work, or any other action. Examples include a Request for Information (RFI), a work directive, a clarification request, a to-do item, an identified deficiency, or any other like item.
- EE. Factory Authorized Representative: An individual fully trained on the equipment and certified by the manufacturer to perform the respective task.
- FF. Factory Testing: Testing of equipment off-site at the manufacturer's facility. May be witnessed by the members of the project team.
- GG. Field Testing by Factory Authorized Representative: On site testing of equipment conducted by a factory authorized representative.
- HH. Functional Completion: A milestone that marks the completion of the Acceptance Phase and successful completion of the FPTs by the CA.
- II. Functional Performance Testing (FPT): The detailed and thorough testing of the building systems and the components and equipment making up those systems. References made to FPT throughout the documents are inclusive of Integrated Systems Testing (IST) unless specifically indicated otherwise.
- JJ. IAQ: Indoor Air Quality
- KK. Integrated Systems Testing (IST): The detailed and thorough testing of the interactions of various systems in the building. ISTs are considered a subset of the overall concept of FPT and therefore references made to FPT will include ISTs unless specifically indicated otherwise.
- LL. Manufacturer's Representative: Either an individual in direct employ of the manufacturer of the applicable system, or an individual who is certified by that manufacturer to perform the applicable work for which the reference is made. This is synonymous with Factory Authorized Representative.
- MM. Mechanical Contractor (MC): Contractor responsible for Division 23 work
- NN. O&M Documentation: Contractor-developed documentation designed to address the needs of facilities personnel and customized for the context of the specific facility and installation. The foundation of O&M Documentation is manufacturer's literature (including 'O&M Manuals', parts lists, troubleshooting guides, etc.) as well as Contractor-developed instructions for startup and shut-down, sequences, and other installation-specific information.
- OO. O&M Manuals: Compilation of O&M documentation,

- PP. Opposite Season: The season opposite of when the majority of the testing occurs. Also referred to as "Seasonal Testing".
- QQ. Performance Verification Testing (PVT): Testing in advance of Functional Performance Testing performed by ATC/EMS contractor at the direction of the CA. Includes a detailed field inspection and 'point-to-point' testing of all equipment to verify proper installation.
- RR. Point of Contact (POC): General reference to the key individual within a given entity.
- SS. Project Phases: Phases of the project include the Construction Phase, Acceptance Phase, and Warranty Phase.
- TT. RFI: Request for Information
- UU. Startup: Refers to the quality control process whereby the Contractor verifies the proper installation of a device or piece of equipment, executes the manufacturer's starting procedures, completes the manufacturer's startup checklist, energizes the device, verifies that it is in proper working order and ready for dynamic testing, and completes the required startup checks, tests and adjustments.
- VV. Startup Checklist Item: A list of items provided by the manufacturer of a device or piece of equipment used to verify proper installation of equipment or systems by the Contractor. Checklist items simply require a 'Yes/No' or 'OK/Not' response. These include primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension checked, oil levels OK, gages in place, sensors calibrated, etc.). Startup Checklist items are one component of the Startup Process (Startup Tests being the other).
- WW. Startup Procedures: Refers to the combination of Startup Checklists and Startup Tests. Startup Procedures are typically performed by the Contractor with or without a formal Cx process. The Contractor documents the startup process by completing and submitting the Startup Procedures. Startup procedures may be a combination of those prepared by the CA, those included in the contractor's quality assurance process, and those required by the manufacturer.
- XX. Startup Test: This is a test that may be a part of equipment startup. It differs from a checklist item in that it requires more than a binary response - an observation, measurement, or sequence of events must be documented. Startup Tests are one component of Startup Procedures (Startup Checklists being the other).
- YY. Systems Manual: The Systems Manual is a LEED requirement and is a commissioning process deliverable that provides the information needed to understand, operate, and maintain the facility and its systems. It should be the repository of all updates and corrections as they occur (even through occupancy). The Systems Manual expands the scope of standard O&M documentation to incorporate additional information developed through the commissioning process.
- ZZ. TAB: Refers to the test, adjust, and balance process or the Testing, Adjusting, and Balancing Contractor.
- AAA. Testing Agency: An independent agency typically retained by the Contractor to perform specialized testing of systems or equipment (most commonly electrical). The Testing Agency shall be qualified and equipped to perform the testing and shall submit appropriate qualifications.
- BBB. Trending: Monitoring and recording a history of parameters typically using the building automation system.
- CCC. Vendor: Refers to the organization that sells a system or piece of equipment to the subcontractor. This may be a branch office of the manufacture or a value-added reseller.
- DDD. Warranty Phase: Includes the early occupancy of the building and can continue through the Warranty Period and at least into the opposite season from when it was initially tested. The CA conducts a 10-month warranty review with building occupants and operations and maintenance personnel.

1.6 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1-2007, "HVAC&R Technical Requirements for the Commissioning Process"
- B. ASHRAE Guideline 4-2008, "Preparation of Operating and Maintenance Documentation for HVAC&R Systems"
- C. NEBB - Procedural Standards for Whole Building Systems Commissioning of New Construction
- D. LEED v4 for Building Design and Construction released in 2013.

1.7 DOCUMENTATION

- A. CM (or Contractors where indicated) shall provide the following documentation for CA review per the procedures specified herein and in other Sections of the specification:
 - 1. Shop Drawings and Product Data: CA shall be provided shop drawings and submittal data for systems and equipment that will be part of the Cx process. Some of these submittals will be reviewed by the CA and others are only needed for record. CA will mark up the Submittal Register to indicate what is required.
 - a) Submittals for Review: CM shall provide the CA with an electronic copy of Shop Drawings and Product Data concurrent with distribution to the A/E.
 - b) Submittals for Record: CM shall provide to the CA the final electronic record copy of the submittal.
 - 2. Draft Startup Procedures: Contractor shall develop Startup Procedures for all applicable equipment and systems along with the manufacturer's application, installation and startup procedures. CA will review draft and recommend approval.
 - 3. Factory Test Reports: Contractor shall provide any factory testing documentation or certified test reports required by the specifications. These shall be provided prior to Acceptance Phase.
 - 4. Schedule Updates: CM shall issue periodic updates to the construction schedule. Provide to the CA at least every two weeks. Contractor shall use schedule to notify Cx Team of scheduled startup and training activities.
 - 5. Exception Record Response: Contractors shall respond to Exception Records for which they are assigned responsibility.
 - 6. Testing and Balancing Reports. Provide all documentation of work of TAB contractor. Documentation shall be provided prior to Acceptance Phase.
 - 7. Completed Startup Procedures: Completed Startup Procedure documentation for all applicable equipment and systems. CA will review prior to FPT.
 - 8. Pre-FPT Checklists: Provide prior to the start of the Acceptance Phase.
 - 9. Equipment Warranties: Provide prior to the start of the Acceptance Phase.
 - 10. Training Plan: Provide prior to the start of the Acceptance Phase.
 - 11. Record Training Documentation: Provide at least 7 days prior to the start of the applicable Functional Performance Testing. The compiled and final record training documentation will be provided by the CM within 14 days of the last training session provided under the construction contract (this will typically be the site-specific controls training). This will take the form of the Training Plan supplemented with evaluations and actual dates and topics.
 - 12. Systems Manual Content: Provide Systems Manual content per the requirements of this section and Division 1 requirements.
- B. Coordinate the record drawings submittal logistics with the rest of the specification. Preferably facilitate electronic sharing of documentation between all parties and possibly a web posting of the drawings.

- C. Record Drawings: Contractor shall maintain at the site an updated set of record or 'As-Built' documents reflecting actual installed conditions and all approved changes and modifications to the contract documents. Contractor shall provide access to the CA to review the As-Built and Record Drawings. Provide Record Drawings in accordance with Division 1.
- D. CA to provide a Final Commissioning Report and LEED™ documentation
 - 1. Final Commissioning Report: Compile final commissioning report. Summarize all of the tasks, findings, and recommendations of the commissioning process.
 - 2. Documentation: Compile LEED™ documentation. Format as required by USGBC for submittal under the referenced green building rating system.
 - 3. LEED™ Online: Complete all commissioning related online forms and post required documentation to LEED™ online.

1.8 COMMISSIONING SEQUENCING AND SCHEDULING

- A. In order to expedite project completion, various systems can be in different stages of the commissioning process simultaneously. CA and Contractor shall cooperate to schedule the Cx tasks to minimize the duration of the Cx activities.
- B. The Commissioning will be categorized into Phases as indicated below.:
 - 1. Construction Phase: This is the period of time when the systems are installed, much of the commissioning documentation is developed, the systems are started, pre-FPTs are executed by the contractors and training may be conducted. For any given system or area, the Construction Phase will end when the CA approves proceeding with Performance Verification and Functional Performance testing.
 - 2. Acceptance Phase: This is the period of time where the systems will undergo Performance Verification Testing and Functional Performance Testing.
 - 3. Warranty Phase: This is the period of time that coincides with the start and end of the contractor's base warranty.
- C. Prior to submission of the baseline schedule, CM will coordinate with the Commissioning Authority to specifically include the detailed tasks involved in the commissioning (Cx) process. Commissioning Authority will provide an initial commissioning schedule that outlines the optimal commissioning process. CM's scheduler shall meet with the Commissioning Authority and the subcontractors to synthesize the commissioning schedule with the general construction process constraints and integrate the agreed upon process into the main construction schedule.
- D. The Cx Schedule will outline generic Cx tasks with precedents or prerequisites to each task. The Cx schedule will also indicate system precedent requirements for startup and acceptance testing. Contractor shall collaborate with the CA to determine impacts of project phasing as applicable. Examples of enumerated tasks include:
 - 1. Contractor preparation of draft Startup Procedures.
 - 2. Contractor preparation of Training Plan.
 - 3. Preparation of Systems Manual content.
 - 4. Testing Agency activities.
 - 5. Electrical Startup by system and zone (or phase).
 - 6. Mechanical startup by system and zone (or phase).
 - 7. Controls Startup by system and zone (or phase).
 - 8. TAB activities by system and zone (or phase).
 - 9. Training Events
 - 10. Performance Verification by Commissioning Agent
 - 11. Functional Testing Dry-Run by ATC/EMS Contractor
 - 12. Functional Testing by system and zone (or phase).
 - 13. Occupant or Regulatory Agency testing or approval process.

- E. Contractor shall completely install, thoroughly inspect, startup, test, adjust, and balance systems and equipment. All activities shall be documented per specified procedures and progress tracked on the construction schedule. Contractor shall notify A/E, Owner, and CA in writing that systems are complete and ready for verification and functional performance testing. CM shall schedule and conduct Formal Witnessed Startups of all systems and equipment in the Cx scope as specified below.
- F. Contractor shall notify CA at least 14 days in advance of any tests, startups, or training. CA shall witness selected tests and startups. Notification shall be accompanied by a schedule showing the coordinated start date and task duration and all currently open precedent requirements.

1.9 ELECTRONIC RECORD SUBMITTALS

- A. Within 30 calendar days after receipt of approval from the Architect on any submittal, for equipment in Division 23, Contractor shall submit a final electronic version of the submittal for future asset management.
- B. Final electronic submittals shall:
 - 1. Be originally authored in electronic media and not scanned versions with hand mark ups unless specifically approved by the Architect.
 - 2. Be provided in Portable Document Format (*.pdf) with selectable text and graphics that are readable. The documents shall be merged into one bookmarked document up to 500 mb. Merged documents shall use hierarchical bookmarks to form a table of contents and provide hyperlinks to the subject topic. For submittals larger than 500 mb, provide a summary document in PDF or HTML format with relative hyperlinks to the associated document files within the same directory or in directories subordinate to the summary document.
 - 3. Include all final ratings, parameters, specifications, options, etc. In the case where the Architect returns the submittal "Approved As Noted, Resubmission Not Required" and includes mark-ups or comments that change the originally submitted ratings, parameters, specifications, options, etc., the Contractor shall correct the documents in the original electronic document prior to submitting the final electronic documents.
 - 4. Highlight the specific rating, parameter, specification, option, etc. when the original document includes multiple alternatives. For instance, when a range of performance parameters are given, or various sizes are shown, or various options are listed, the applicable item shall be indicated by highlight, circle, pointer, etc.
 - 5. Not necessarily include generalized direction from the Architect that does not related to ordering and purchasing the equipment. For instance, notes like, coordinate with xxx for final motor horsepower are not to be transferred to the electronic submittal. In that example only, the final coordinated sizes would be indicated.
- C. Final Electronic Submittals shall be either posted to the project web site or provided on compact disc.

1.10 COORDINATION MANAGEMENT PROTOCOLS

- A. Coordination responsibilities and management protocols relative to Cx are initially defined below but will be refined and documented in the Construction Phase Cx Kick Off meeting. Contractor shall have input in the protocols and all parties will commit to process and scheduling obligations. The CA will record and distribute.
 - 1. Submittals and Shop Drawings: CM shall distribute these to the CA. CA shall edit the Submittal Log to communicate which submittals must be forwarded.
 - 2. CA Review Comments on Shop Drawings: Posted on the electronic forum and a copy sent directly to the A/E and CM by the CA. A/E to consider and incorporate at their discretion.

3. Deficiencies Identified by the CA: When the CA identifies a deficiency, the CA shall make a good faith assessment of responsible parties. Those parties, as well as the CM, shall be notified of the perceived deficiency. This communication is FOR INFORMATION ONLY and is not a direction to resolve the deficiency. Contractor may accept responsibility and resolve the deficiency voluntarily. If contractor contests either the deficiency or responsibility for that deficiency, Contractor shall respond to that deficiency indicating disagreement. If responsibility is not agreed to via the Cx dialogue, Owner or CM shall issue a work directive or RFI via the normal contractual channels to resolve the issue.
4. Requests for Meetings: In general, requests by the contractor for a meeting with the CA shall be routed through CM who will then determine the validity. Note that every attempt should be made to deal with Cx issues at regularly scheduled Cx Meetings.
5. Control Sequence Modifications: CA shall make every attempt to thoroughly review the sequences during the submittal phase and address any issues prior to the submittal approval. However, CA and the ATC/EMS Contractor may incorporate minor changes to the sequence during testing when it is apparent that it improves the control of the equipment but does not fundamentally change the intent of the sequence. The time required by the ATC/EMS Contractor for this type of modification is addressed in Section 23 08 59. Any and all changes must be thoroughly documented in the record documents.
6. Scheduling Coordination – CA shall consult directly with the CM to incorporate the Cx tasks in the project schedule. The process logic and integration shall ultimately be collaboration between CM, CA, and contractors. The effort will start with CA and CM proposing initial logic. Then subcontractors will join the discussion and work out the final details, (precedent logic and durations).
7. Notification of Completion Milestones – Contractor shall notify Owner and CM at least two weeks prior to an anticipated Cx activity or Cx milestone (such as readiness for FPT). CM shall then coordinate the scheduling of the activity (as applicable) between all required parties as necessary. Notification shall be communicated in an agreed upon format as determined during the Cx process.
8. Exceptions Record: CA maintains a categorized Exceptions Record which tracks the Cx-related items. The Exceptions Record will be available to all parties who have credentials on the portal. Any party with credentials may respond to an Exception Record. Any party that is copied on an email resulting from an Exception Record posting may respond to it and contribute to the dialogue.
9. Startup Checklist and Test Documents: The contractor shall submit the manufacturer's startup procedures and checklists to the CA for review and approval. The Contractor then performs the approved Startup procedures, completes the documentation and signs it, and submits it. CA may subsequently spot check the procedures and documentation. They are then included in the Commissioning Record.
10. Functional Performance Test Documents: Functional performance tests are prepared and completed by the CA. They are developed during the construction phase after completed submittals have been received and approved. CA forwards the FPT procedures to the Cx Team. Contractors approve the procedures and/or identify any portion of the procedures that cannot be performed for technical, scheduling or other reasons. Throughout the Cx process, CA maintains a current record of the testing procedures and keeps the documentation up to date and accessible for all to access the current progress.

1.11 CONTRACTOR RESPONSIBILITIES

- A. Construction Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Construction Phase.
 1. Include Cx requirements in price and plan for work.
 2. Designate a Cx Coordinator (CxC) from each major subcontractor with activities related to commissioning. These Cx Coordinators are to be the primary contacts for Cx activities.

3. Attend Construction Phase Cx Kick Off Meeting. The Cx Coordinator and Project Manager from each major subcontractor shall attend at a minimum.
4. The Cx Coordinator shall attend all Cx progress meetings unless otherwise agreed to by the CA.
5. Remedy any deficiencies identified throughout construction.
6. Prepare and submit required draft Startup Procedures and submit along with the manufacturer's application, installation and startup information.
7. TAB shall submit sample balancing forms for approval prior to starting work.
8. Schedule and coordinate Cx efforts into the construction schedule. Incorporate the precedent diagram provided by the CA into the construction schedule. Indicate at a minimum all tasks enumerated on the precedent diagram for all systems.
9. Coordinate the work of subcontractors, vendors, manufacturers, and Testing Agencies provided under Contractor's contract, and ensure that these parties are informed of and are adhering to the requirements of the Cx process specified throughout the contract documents. Particular reference is made to providing the required Systems Manual information; to submittal of training materials and documentation of that training; to collaboration with the overall startup and testing process; to developing comprehensive integrated procedures for scheduling and task notification and documenting them in a common format; and to electronic delivery requirements if applicable.
10. Develop and submit Temporary Conditioning Plan.
11. Provide assistance to the CA in preparation of specific Functional Performance Test (FPT) procedures. Contractors, subcontractors and vendors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests. Damage caused to equipment performed in accordance with the approved procedures will be the responsibility of the Contractor.
12. Thoroughly complete and inspect installation of systems and equipment as detailed throughout Contract Documents, as required by reference or industry standards, and as specifically indicated elsewhere this section.
13. Startup, test, adjust, and balance systems and equipment prior to verification and performance testing by the Commissioning Authority. Startup procedures shall be in accordance with Contract Documents, reference or industry standards, and individual Cx specifications. Provide skilled technicians qualified to do the work required. Provide factory trained/authorized technicians where required by the contract documents and stated in the applicable technical section. Startup and testing shall proceed from device checkout, to component checkout, to system checkout, to inter-system checkout.
14. Prepare spaces with adequate security for onsite contractors to store equipment. TAB, CA, ATC/EMS will need space to conduct business and will not justify the cost of their own facilities.
15. Schedule for representative space mock ups as early as possible to facilitate determining standards for close out
16. Record startup and testing procedures on startup forms or checklists and certify that the systems and equipment have been started and or tested in accordance with the requirements specified above. Each task or item shall be indicated with the party actually performing the task or procedure.
17. Provide skilled technicians qualified to perform the work required.
18. Provide factory-trained and authorized technicians where required by the Contract Documents.
19. Record Startup Procedures on startup procedure forms and certify that the systems and equipment have been started and or tested in accordance with the requirements specified above. Each task or item shall be indicated with the Party actually performing the task or procedure.

20. Tag equipment that is started with the Individual's name and date.
 21. Demonstrate the operation of all systems as specified.
 22. Certify that systems have been installed and are operating per Contract Documents prior to Acceptance Testing.
 23. Maintain an updated set of Record Documentation as required by the Contract Documents.
 24. Copy the CA on indicated documentation.
- B. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Acceptance Phase.
1. Perform performance verification of ATC/EMS system as specified in section 23 08 59.
 2. Assist CA in functional performance testing. Assistance will typically include the following:
 - a) Manipulate systems and equipment to facilitate testing.
 - b) Provide any specialized instrumentation necessary for functional performance testing.
 - c) Manipulate ATC/EMS and other control systems to facilitate functional performance testing.
 3. Correct any work not in accordance with Contract Documents.
 4. Participate in Training Events.
 5. Maintain record documentation, and update and resubmit it after Compensate CA for additional site time required to complete or repeat testing due to incompleteness of systems or equipment at time of Functional Performance Testing.
 6. Monitor systems, equipment and areas until Final Acceptance by Owner. Log and diagnose all alarms during this period. Maintain trends and logs of all critical parameters. Forward the logs and trends on a weekly basis throughout all Endurance Periods.
- C. Warranty Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Warranty Phase.
1. Provide warranty service;
 2. Conduct ATC/EMS Sequence Training;
 3. Respond to and document Warranty issues;
 4. Participate as required in the opposite season testing;
 5. Correct any deficiencies identified throughout the Warranty Phase;
 6. Update record documentation to reflect any changes made throughout the Warranty Phase and resubmit final Record Drawings at the close of the Warranty period.

1.12 EQUIPMENT SUPPLIER/VENDOR RESPONSIBILITIES

- A. Construction Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier (and their subcontractors) during the Construction Phase.
1. Provide shop drawings and product data in hard copy and electronic format.
 2. Provide manufacturer's application, installation and startup instructions within 30 days of shop drawing/product data approval.
 3. Participate in controls coordination meetings or conference calls to ensure integration of equipment/systems as required by the Contract Documents.
 4. Where factory-authorized startup is specified, coordinate and participate in the specified commissioning process and document startup on the appropriate forms.
 5. Review and approve Functional Test Procedures affecting supplied equipment.
 6. Where training is to be provided by factory-authorized personnel, provide required Training Plan information including course content for approval prior to conducting the training.

7. Conduct and document training vents as required by this Section, and by applicable sections of the Specifications pertaining to each piece of equipment or system.
 8. Provide spare parts and materials as required by Specifications.
 9. Provide special tools as required by the Specifications.
 10. Provide *Systems Manual* content as required and develop project-specific O&M content as required by the Cx requirements.
 11. Provide all warranties.
- B. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier (and their subcontractors) during the Acceptance Phase.
1. Participate in any Functional Testing Procedures required.
 2. Consult on issues identified relative to the supplied equipment.
- C. Warranty Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier (and their subcontractors) during the Warranty Phase.
1. Provide any warranty service required to the supplied equipment.
 2. Maintain *Systems Manual* content relative to supplied equipment.
 3. Provide technical support to the Owner's facilities personnel.
- 1.13 COMMISSIONING KICK OFF / COORDINATION MEETING
- A. CA shall schedule and conduct a Cx coordination meeting near the beginning of construction. The following should be discussed at this meeting:
1. CA will present:
 - a) Commissioning Documents
 - b) Commissioning Requirements
 - c) Responsibilities of the construction parties
 - d) Management protocols
 - e) Required submittals
 - f) Schedule
- 1.14 STARTUP PROCEDURES AND DOCUMENTATION
- A. Purpose: The Cx process requires documentation that the normal quality control processes involved with preparing systems and equipment for operation are properly performed and thoroughly documented.
- B. Startup Procedures: Startup Procedures (consisting of checklists and tests as above) for each type of equipment and system shall be submitted to the CA for review and approval prior to startup.
- C. 'Generic' Startup Procedures: Refer to Section 23 08 00 and the Cx Plan for generic Startup Procedures for a variety of mechanical and electrical systems. The content of these Startup Procedures shall provide the minimally acceptable content.
- D. Startup Forms and Checklists: Contractor and Vendors shall provide manufacturer's standard startup checklists, forms, and protocols for review early in the construction process. Submittal of the information shall be within 30 days of the submittal approval.
- E. Manufacturer's Requirements: Startup Procedures shall incorporate all manufacturer-specified procedures.
- F. Recording and Documentation of the Startup: Manufacturer's startup protocols shall be executed, and forms shall be completed by a qualified/authorized technician. These shall either be produced electronically or shall be scanned and submitted electronically.
- G. Owner Access: Contractor shall allow access by Owner's representatives to inspect the equipment and ensure its proper operation. Owner will be allowed to affix service tags to equipment to track the proper maintenance.

1.15 FUNCTIONAL PERFORMANCE TESTING

- A. The objective of Functional Performance Testing is to demonstrate that each system is operating according to the documented *Owner's Project Requirements* and Contract Documents. Functional Performance Testing facilitates bringing the systems from a state of Substantial Completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
- B. The logistics and procedures involved in Functional Performance Testing are outlined below and in Section 01 91 15.

1.16 DEFICIENCIES IDENTIFIED DURING FUNCTIONAL TESTING

- A. Non-Conformance. Non-conformance deficiencies identified during Functional Performance Testing shall be resolved as follows:
 - 1. The CA will record the results of the functional test in CxWorx. All deficiencies or non-conformance issues shall be noted as Exception Records and reported to the Owner.
 - 2. Corrections of identified minor deficiencies may be made during the tests at the discretion of the CA. In such cases the deficiency and associated resolution will be documented in the database.
 - 3. Every effort will be made by the CA to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
 - 4. As tests progress and a deficiency is identified, the CA will discuss the issue with the executing Contractor.
 - a) When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
 - 1) The CA shall document the deficiency along with the Contractor's response and intentions, and they go on to another test or sequence. A copy/email of the deficiency shall be generated and provided to the Contractor and CA. The Contractor corrects the deficiency, completes the Exception Record response certifying that the issue is resolved, and /or the equipment is ready to be retested, and sends it back to the CA.
 - 2) The CA reschedules the test and the test is repeated.
 - b) If there is a dispute about a deficiency, regarding whether it is a deficiency and/or who is responsible:
 - 1) The deficiency shall be documented as an Exception Record with the Contractor's response and the CM will be notified. The CM will track this issue under the construction contract dispute resolution provisions.
 - 2) Final interpretive authority is with the A/E. Final acceptance authority is with the DM.
 - 3) The CA documents the resolution to the Exception Record.
 - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, and responds to the Exception Record indicating completion. The CA reschedules the test and the test is repeated until satisfactory performance is achieved. CA then closes the Exception Record.
- B. Cost of Retesting: The cost for the CA to retest a Startup or Functional Performance Test shall be paid by the Contractor responsible for the deficiency. Owner shall pay the CA directly and back charge the responsible Contractor.
- C. Failure Due to Manufacturer's Defects. If 10% or three, whichever is greater, of identical pieces of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, all identical units may be considered unacceptable by the DM. (For the purposes of defining 'identical equipment' for this Section,

size or capacity alone does not constitute a difference.) In case of failure due to manufacturer's defects, the Contractor shall provide the Owner with the following:

1. Manufacturer's response in writing as to the cause of the failure and proposed resolution.
2. Manufacturer shall implement their proposed resolution on a representative sample of the product.
3. The DM will determine whether a replacement of all identical units or a repair is acceptable.
4. Upon acceptance, the manufacturer shall replace or repair all identical items at their expense and shall extend the warranty accordingly (if the original equipment warranty had begun).
5. Manufacturer shall pay the costs of all retesting necessitated by the failure.

1.17 TRAINING EVENTS

- A. General: Adequate and thorough training of the Operators and the facilities staff is vital to effective transition and early occupancy of the building. A key goal of the Cx Team is to ensure that this is accomplished. Contractors, Subcontractors, and Manufacturers/Vendors as specified shall prepare and conduct training sessions on the installed systems and equipment for which they are responsible. The Contractor shall be responsible for insuring all other training is performed in accordance with the Contract Documents.
- B. Training Events Overview. Training Events include all classroom and field-based training sessions that result in the training or transference of Design Team or Contractor knowledge to the Owner. The following Training Events shall be executed as part of the Training Program:
 1. Design Orientation Training: The CA and A/E shall be responsible for conducting a Design Orientation Training per the Cx Plan. This will be conducted by the Design Team after systems are placed but before Startup and shall be attended by the Contractor.
 2. Equipment and Systems Training: The Contractor (or Manufacturer's Representative) shall provide training to the Owner/Operators on individual systems and equipment only after successful Startup. These training events cover proper operation, maintenance, repair, and diagnosis of the systems, equipment, and components installed by the Contractor. Details are provided elsewhere in this Section.
 3. Final Systems Operation Training: The Contractor shall provide training to the Owner/Operators on whole-building operation. This training shall focus primarily on ATC/EMS control of building systems and operation and its impact on building performance and shall be conducted after FPTs have been substantially completed.
- C. Training Means and Methods: Details on the means and methods for conducting training, including location requirements, preparation, methods for presentation, scheduling, instructor qualifications, and other details are provided in the specifications. Training sessions should typically start and end in a classroom setting. Field demonstrations will also typically be conducted to demonstrate the hands-on aspects of the required tasks.
- D. Training Plan Document
 1. The *Training Plan* shall outline the *Equipment and Systems Training* and *Final Systems Operation Training* Events as proposed by the Contractor, and shall be approved by the CA. Contractor will compile the individual training agendas of the subcontractors and vendors and submit a comprehensive *Training Plan* to the CA, Architect and the Owner for review. *Training Plan* shall summarize all equipment and systems-related training events with topics to be covered and approximate training duration.
 2. The *Training Plan* shall include at a minimum:
 - a) Topic and applicable specification section;
 - b) Scheduled date(s) for the Events(s);
 - c) Location and setting (classroom or field);

- d) Lead instructor and instructors' qualifications;
 - e) Co-instructors and their qualifications;
 - f) Training objective;
 - g) Event outline/agenda;
 - h) Detailed breakout of content to be presented;
 - i) Anticipated duration;
 - j) Required attendees for each session.
3. Review: Contractor shall submit *Training Plan* to the CM, who will then disseminate it for review. Contractor shall incorporate comments and requirements resulting from the review and resubmit the *Training Plan* prior to conducting any training sessions.
- E. Training Prerequisites: Training shall not be conducted until the subject system or equipment is operating properly and after it has been successfully started per the commissioning requirements. If Contractor wishes to schedule both Startup and Training on the same day/visit, Contractor shall allow enough time to fully startup and document startup of the systems. If the systems are not fully functioning, training will be canceled and rescheduled.
- F. Record Training Documentation: The Contractor must document all training sessions. Beyond that included in the *Training Plan*, documentation shall include the names of the attendees. Training shall follow handouts that list at a minimum the key points in bullet-form presentation style, and presentation handouts shall be provided even when training follows detailed written documentation. Training will not be approved unless it contains accompanying written documentation.
- G. Equipment and Systems Training
1. Description: Training of Owner/Operators on individual systems and equipment shall be conducted by the Contractor or Manufacturer's Representative only after successful Startup has been completed. This training will typically occur over a period of time as multiple events as systems and equipment are ready. This training shall cover proper operation, maintenance, repair, and diagnosis of the systems, equipment, and components installed by the Contractor. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. These sessions shall use the manufacturer's printed installation, operation and maintenance instruction material and shall include a review of these instructions emphasizing safe and proper operating requirements and preventative maintenance. The orientation and inspection function of the equipment in the system shall be discussed. Training shall follow handouts that list the key points in bullet form presentation-style or follow detailed written documentation. Training will not be approved unless it contains accompanying written documentation.
 2. Equipment Covered: Training shall be provided for all major items of commissioning-related equipment and per the Specifications.
 3. Minimum Training Content: *Equipment and Systems Training* shall include as a minimum for each type of equipment:
 - a) Presenting the equipment in the context of this facility. Typically, the responsible subcontractor will provide this introduction to the session. The trainer shall review how the equipment serves *this specific* facility. Information shall include equipment amounts, numbers, capacities, sizes and locations and shall show the equipment in applicable system schematics.
 - b) Conceptual overview of how the equipment works;
 - c) Names, addresses, phone numbers, websites of sources for information, tools, spare parts, and other details for the equipment;
 - d) Details of the warranty or guarantee;
 - e) Intended sequences of operation in all modes of operation;
 - f) Limits of responsibility (example: unit-mounted controls vs. ATC/EMS);

- g) Sources of utility support;
 - h) Routine operator tasks involving monitoring and operation, covering all modes of operation and mode switching as applicable;
 - i) Relevant health and safety practices/concerns;
 - j) Common problems and their diagnosis and repair;
 - k) Proper maintenance schedules, tasks and procedures with demonstrations;
 - l) Emergency response, documentation and recovery procedures.
4. Scheduling: These events shall be coordinated through and scheduled by the CA.
 5. Attendees: Contractor shall insure that all appropriate subcontractors be present for these sessions. Any Cx Team member is eligible to attend. Required attendees include the applicable Contractors (Lead), CA, and the Owner/Operator.
- H. Final Systems Operation Training
1. Description: *Final Systems Operation Training* provides the Owner and Operators a training session on whole-building operation. It shall focus primarily on ATC/EMS control of building systems and operation and its impact on building performance. System interactions shall be presented and discussed (such as a combined air handler, chiller, boiler, and terminal unit system), along with a detailed presentation of the sequences of operation and their relationship to the ATC/EMS. This training shall be conducted by the BAC with assistance from the CA, and shall be attended by the Owner, Operators, Contractor, Design Team, and by any other Commissioning Team members deemed necessary by the CA or the Owner.
 2. Coordination with ATC/EMS Training: Detailed ATC/EMS component training for the facility Operators shall be considered as part of *Equipment and Systems Training*. This training shall have been completed prior to *Final Systems Operation Training*.
 3. Scheduling: *Final Systems Operation Training* shall be conducted after all FPTs have been successfully executed.
 4. Attendees: Any Cx Team member is eligible to attend. Required attendees include the BAC (lead), CA (assist), CM, MC, MDE, and Owner/Operators.

1.18 SYSTEMS MANUAL PREPARATION AND LOGISTICS

- A. CA shall assemble a complete *Systems Manual* providing essential facility information. In hardcopy format, the *Systems Manual* will typically consist of multiple individual binders. Contractors and their subcontractors shall provide all the content applicable to their Division of work in the format specified by the CA. The content and organization of the *Systems Manual* shall be as indicated in this section. The *Systems Manual* shall be provided in electronic (pdf) format.
- B. The *Systems Manual* shall provide the information needed to understand, operate, and maintain the facility and its systems. It should be the repository of all updates and corrections as they occur (even through occupancy). The *Systems Manual* expands the scope of standard O&M documentation to incorporate additional information developed through the commissioning process. The *Systems Manual* includes but is not limited to the standard Contractor-developed materials related to O&M and training, as well as the Design Team-developed *Owner's Project Requirements* and *Basis of Design* document, and certain design drawings.
- C. Contractor, Subcontractors and Vendors/Factory Representatives shall prepare, organize and submit applicable content for the comprehensive and coordinated *Systems Manual* as specified in this section. Content for one system and all associated equipment must be organized and made in one submission. Systems may be submitted separately based on the progress of the project. Each submission shall be indexed as a sub-entity to the overall *Systems Manual* submission.
- D. Requirements as specified include requiring the applicable Contractors to author project-specific information in a consistent format in addition to submission of standard pre-printed

manufacturer's O&M and product information. The content provided by all Divisions will be incorporated by the CA into a single comprehensive *Systems Manual*.

- E. Maintenance of the applicable *Systems Manual* information throughout the Warranty Period shall include:
1. Changing any indicated settings, parameters, and other operational parameters that were changed by the Contractor during the Warranty Phase.
 2. Changing any instructions as to procedures that needed to be changed during the Warranty Phase.
 3. Changing the record Schedules and/or Sequences of Operation if they were changed during the Warranty Phase.
 4. Updating any Operation and Maintenance instructions if they were changed or updated by the manufacturer.

1.19 SYSTEMS MANUAL CONTENT AND ORGANIZATION

The Systems Manual format and content requirements shall be as follows. The Party responsible for each topic shall assemble, author, develop, coordinate, or otherwise produce the content for that topic and provide to the CA.

A. Manual Section 1 - Facility Information

1. Directory of Entire Manual: Provide a directory indexing the entire set of manuals that comprise the *Systems Manual*.
2. Contact Directory: Include the contact information for all contractors, subcontractors, vendors, manufacturers, and any other entity that has provided goods or services installed at the facility. Contact information should include name, website, address, phone numbers, and technical support phone numbers and email addresses.
3. General Facility and System Description: [Architect] Describe the function of the facility. Detail the overall dimensions of the facility, number of floors, foundations type, expected number of occupants, and facility category code. List and describe all the facility systems listed in Part II - Primary Systems Information and any special building features (for example, cranes, elevators, and generators).
4. Floor Plans [Architect]: Provide uncluttered, legible 11 by 17-inch floor plans. Include only room numbers, type or function of spaces, and overall facility dimensions on the floor plans. Do not include construction instructions, references, frame numbers, etc.
5. Utility Connection and Cutoff Plans [Engineer]: Provide utility site and floor plans that indicate the exterior and main interior connection and cutoff points for all utilities. Include enough information to enable someone unfamiliar with the facility to quickly locate the connection and cutoff points. Do not include items such as contour lines, elevations, and subsurface information on the site plans. Indicate the room number, panel number, circuit breaker, valve number, etc., of each connection and cutoff point, and what that connection or cutoff point controls. These plans are in addition to the floor plans.
6. Warranty Information [Construction Manager]: shall provide all warranties indexed in a logical order.

B. Manual Section 2 - Primary Systems Operating Information

This Part shall be organized by Division then system/subsystem using a systems approach. Part 2 contains system information, whereas Part 3 contains equipment information.

1. System Description [Engineer]: Provide a detailed discussion of the system composition and operation. Include technical details that are essential for an understanding of the system. A/E shall provide narratives to the CM who shall provide these to the major subcontractors for use in the systems description. Also cross-reference O&M data contained in Part 4 and product data and submittals contained in Part 4.
2. Contact Information [Construction Manager]: Provide contact cross-references to the Parties applicable to the system being described and contained in the main Contact Directory in Part 1.

3. System Flow Diagrams [Engineer]: Provide a flow diagram indicating system liquid, air (do not include ductwork) or gas flow during normal operations. Integrate all system components into the diagram. Note that a compilation of non-integrated flow diagrams for the individual system components is not acceptable.
4. Diagrammatic Plans [Engineer]: Provide floor plans indicating the location of equipment and configuration of the system installation. Include the configuration of associated piping or wiring, subordinating structural features to utility features.
5. Startup and Shutdown Procedures [Contractor]: Provide step-by-step instructions to bring systems from static to operational configurations and from operating to shutdown status. Installing Contractor or Vendor/Manufacturer shall author this specifically for this project.
6. Normal Operating Instructions [Contractor]: Provide a discussion of the normal operation and control of the system. Address operating norms (for example, temperatures, pressures and flow rates) expected at each zone or phase of the system. Supplement the discussion with control and wiring diagrams and data. Installing Contractor or Vendor/Manufacturer shall author this specifically for this project.
7. Emergency Operating Instructions [Contractor]: Provide emergency operating procedures in the event of equipment malfunctions. Provide shutdown instructions for fires, explosions, spills, or other contingencies. Installing Contractor or Vendor/Manufacturer shall author this specifically for this project. This content shall be in the context of the systems themselves and support the Emergency Operations manual to be created by the Owner.
8. Environmental Considerations [Contractor]: Provide a listing of the equipment that requires special operation, reporting, testing, analysis or inspection to comply with federal, state or local environmental laws. Examples of possible list items include back flow preventer inspections, underground storage tank testing, hazardous material or waste usage/storage documentation and air pollution control devices. For each item, include requirements for environmental operation, reporting, testing, analysis and inspection as well as references to respective implementing regulations, statutes or policies.
9. Equipment and System Training Documentation [Construction Manager/Contractor]: Include documentation of training for applicable system. Include training agenda, all handouts and presentation materials/content. Reference existence and index of DVD or video tape recording.
10. Sequence of Operation/Control Schematic [Control Contractor]: Provide the written sequence of operation for the applicable system and the control schematic diagram.
11. Maintenance Service Agreements [Construction Manager]: Provide copies of maintenance service agreements where there pertain to systems involving multiple components and devices as indexed in Part 3.
12. Balancing Reports [Contractor]: Insert the Balancing Reports provided under Section 23 05 93 for the subject system.

C. Manual Section 3 - Maintenance Manual

Organize this section by first discipline then by equipment number or ID.

1. Maintenance Index [Contractor]: Provide a summary table that indexes the equipment requiring maintenance and indicates the frequency each piece of equipment needs attention, and a reference to the number of the Procedure associated with that frequency. CM will provide Contractors with an *Excel* spreadsheet that will be completed by each applicable subcontractor and returned to the CM for incorporation in the Facilities Manual.
2. Maintenance Information [Contractor]: Maintenance Information for each indexed entry shall contain the following:
 - a) Equipment Data Sheet: Provide a summary of key nameplate and performance data.

- b) Procedures: Provide a 'Task Card' or step-by-step procedures for each individual maintenance procedure for a given frequency identified on the Maintenance Index. Include detailed PM procedures, safety instructions and precautions including Lock Out/Tag Out precautions, required skill level, number of personnel needed, frequency, special tools needed, parts needed, and estimated time required to complete the task. These procedures shall be indexed in a manner approved by the Owner. These shall be provided as Microsoft Word files or scanned documents from the manufacturer's O&M Manual in either (pdf, tif, jpg or bmp formats)
- c) Equipment and Systems Training Documentation: Include agenda, all handouts (exclusive of O&M documentation that is included below) and presentation materials/content. Reference existence and index of DVD or video tape recording.
- d) Field Test Reports: Provide Field Test Reports that apply to equipment associated with the system.
- e) Troubleshooting Instructions: Provide detailed trouble-shooting procedures indexed by common/expected symptoms. Alternatively, make specific reference to page in the manufacturer's O&M Manual where this information is provided.
- f) Extended Warranty Information: Include all warranties for products, equipment, components, and sub-components whose duration exceeds one year. Include warranties on components with the system they are a part of. Reference all specific operation and maintenance procedures that must be performed to keep the warranty valid.
- g) Special Tools: Provide a listing of any special tools required for servicing, diagnosis, or repair. Alternatively, reference specific page in the manufacturer's O&M Manual where this information is provided.
- h) Supply Inventory Requirements: Provide a list of maintenance and repair supplies (e.g., spare parts, fuels and lubricants) required to ensure continued operation without unreasonable delays. Identify and list parts and supplies that have long purchase lead times. Alternatively, reference specific page in manufacturer's O&M Manual that contains this information.
- i) Sources of Spare Parts: Include reference to contact information where spare parts can be obtained.
- j) Lubrication Schedule: Provide a lubrication schedule indicating types, grades, and capacities of lubricants for specific temperature ranges and applications. Alternatively reference the specific page in the manual that contains this information
- k) Maintenance Service Agreements: Provide copies of maintenance service agreements where they pertain specifically to indexed equipment.
- l) Manufacturer's O&M Manual: Include manufacturer's printed O&M information. These shall be provided in pdf format. If unavailable as pdf from the manufacturer, hardcopy manual shall be scanned and provided as a single file.
- m) Application and Installation Instructions: Where applicable and separate from the O&M instructions, provide the Application and Installation Instructions that indicate how to correctly apply and install/setup the equipment.

D. Manual Section 4 - Construction Documentation

- 1. Record Drawings [Architect]: Provide an index of all record drawings with drawing number, title, and electronic file name(s) including electronically referenced drawings.
- 2. Record Specifications [Architect]: Provide a detailed index of the record specification. Include sections and major items in the specification all indexed to the appropriate page number.
- 3. Approved Product Data and Shop Drawings [Architect/Engineer]
 - a) Provide an index of all product data and shop drawings. This shall list all equipment with the associated submittal number

- b) Organize and compile only APPROVED product data and shop drawings. Providing these in a filing format is acceptable provided all files are identified and organized for easy access.
 - c) Inclusion of any of this information in previous sections of the Facilities Manual does not allow exclusion in this section.
4. Commissioning Record [Commissioning Authority]: Provide complete commissioning records including all Startup Procedures and Functional Performance Test documentation.

1.20 TEMPORARY CONDITIONING

- A. Contractor shall only use building permanent equipment to provide temporary conditioning with the prior approval of Owner. Approval for such use will only be given upon acceptance of a detailed plan provided by the individually involved subcontractors and compiled by the CM. The temporary conditioning plan shall consider/address the following at a minimum.
- 1. Indicate that the full startup protocol as required by the specification for final acceptance will be performed for the temporary startup. Temporary conditioning plan shall include the startup forms to be used which will be the same as those that will be used for final startup.
 - 2. Contractor shall address how equipment will be maintained in good, clean condition. Specifically address:
 - a) Temporary filtering of air: Air Filters used for construction shall be at least that specified for final use. Contractor shall remove construction filters and replace with new filters at substantial completion. Filters shall be maintained and replaced at the specified final pressure drop. Contractor shall install a manahelic for visual indication of pressure drop as well as set up the loaded filter DP switch for monitoring on the ATC/EMS.
 - b) Temporary Filtering of Water and Condensate: Construction strainers shall be used while circulating fluid during construction. Strainer shall be finer than specified for final strainers.
 - c) Sealing/Filtering of Open Ducts: Address that all open ducts shall be either sealed or protected with filter media. Return or exhaust systems shall not be used during construction unless otherwise approved.
 - d) Lubrication and Maintenance: Contractor shall maintain the systems and equipment in accordance with the manufacturer's instructions. Contractor shall coordinate lubricants used with Owner's operators. Frequency of lubrication and inspection shall be as recommended by manufacturer's literature. Applicable maintenance lubrication schedules shall be included in the plan. Draft maintenance logs shall be submitted with plan and completed as maintenance is performed.
 - e) Operation outside of Normal ranges: Systems and equipment shall not be operated outside the range of specified conditions. Plan shall address how the contractor will ensure that operation will not harm the equipment
 - f) Emergency Condition Identification and Response protocols: Plan shall address protocols for responding to equipment malfunctions and or harmful operation. Automatic safeties and remote enunciation shall be in place to protect people and property. Temporary operation shall not be allowed until there is an automatic communication/enunciation medium such as a phone connection or an internet connection. At a minimum, an alarm on the equipment used for temporary service shall be automatically sent to the contractor's 24-hour monitoring service and to the Owner's help desk. The contractor shall respond to and be responsible for securing conditions within the building. Owner shall assess the situation and as necessary secure utilities feeding the building from isolation points outside of the building.

3. Building Protection: Address how the system will be controlled to avoid humidity conditions that will either promote mold growth or cause corrosion.
4. Equipment Reconditioning: Address with specific means and methods how the equipment used for temporary conditioning will be re-conditioned to new condition. Belts, seals, bearings, couplings, or other parts that wear more than 3% of their expected life shall be replaced.
5. Cleaning: Address how ducts, pipes, coils, converters, air handling equipment, terminal units, etc. shall be cleaned at final turn over.
6. Operations Log: Contractor responsible for operating the equipment shall maintain a log of all activities associated with operating and maintaining equipment. Log shall be submitted to Owner on a frequency specified by them.
7. Operating System Alterations: Plan shall address specific protocol for doing work the systems
8. Any material, device, component, equipment, etc. that is assessed as damaged or as having a substantially shortened life as a result of temporary conditioning operation shall be replaced by the contractor at no cost to the contract.
9. Segregation: Where only portions of a system are to be used, contractor shall specifically indicate how the used portion will be isolated from the unused portion. Plan shall address how to ensure that the reduced operation condition will be maintained within acceptable ranges, and/or how capacity will be throttled to keep all operating parameters in recommended ranges.

1.21 PHASING PLAN

- A. If contractor intends to start, run, or occupy portions of systems in phases, contractor shall submit a plan for phasing in areas/portions of systems that will be connected subsequent to the initial portions. Specifically address:
 1. Pipe and Duct Cleaning: indicate the configurations and protocols for isolating subsequent regions and then protecting the preceding regions when the subsequent region is cleaned/flushed and connected.
 2. Pipe disinfection: Indicate the plan for disinfecting each region of potable water or medical gas pipe that requires disinfection. Indicate how the preceding regions of the system will be protected when connecting subsequent regions.
 3. Piping Certification/Testing: Indicate the plan for certifying each region of pipe that requires certification and or testing such as laboratory gases, medical gases, and RO/DI water (testing for water quality). Indicate how the preceding regions of the system will be protected when connecting subsequent regions. Indicate how you will verify that the certification/test results on the previous systems have not been invalidated.
 4. System Modifications: Indicate the protocols for making subsequent changes to the systems of pipe and duct when the systems have already been cleaned, flushed, pressure tested, disinfected, certified, etc.

PART 2 – PRODUCTS

2.01 INSTRUMENTATION

- A. General: All testing equipment used in the commissioning process shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available.
- B. Standard Testing Instrumentation: Standard testing instrumentation normally used for performance assessment and diagnosis will be provided by the CA. Refer to Sections 23 08 00 for a list of applicable test equipment.

- C. Special Tools: Special equipment, tools and instruments (only available from a vendor, and specific to a piece of equipment) that are required for testing equipment in accordance with the Contract Documents shall be included in the base bid price to the Contractor and left on site for the Owner.

2.02 TEST KITS FOR METERS AND GAGES

- A. Test kits for meters and gages shall be provided to the Owner new and in good condition. Previously used test kits will be unacceptable. Kits shall be submitted prior to the Acceptance Phase. Kits required are specified in the individual technical specifications and in 23 08 00.

PART 3 – EXECUTION

3.01 FUNCTIONAL PERFORMANCE TEST EXECUTION

- A. Functional Performance Testing procedures are specified in Section 01 91 15. Contractor shall participate in the development of the testing procedures as needed.

- END OF SECTION 01 19 13 -

SECTION 01 19 15
FUNCTIONAL PERFORMANCE TESTING (FPT) PROCEDURES

PART I – GENERAL

1.01 WORK INCLUDED

- A. Functional Performance Testing of systems.
- B. Documentation of FPTs.
- C. Acceptance criteria.

1.02 SCOPE

- A. This section describes the Functional Performance Testing (FPT) process, procedures, and requirements. It is intended to illustrate (i) the Contractor's requirements for assisting the Commissioning Authority (Commissioning Authority) with the functional performance testing of systems, and (ii) to demonstrate the level at which systems and equipment will be tested prior to being deemed 'Acceptable' to the Owner.
- B. The Commissioning Authority will prepare itemized and detailed testing plans and procedures that:
 - 1. Specify individual tests and procedures that meet the requirements of the Commissioning Plan and commissioning process;
 - 2. Serve to document and record the testing procedures and the results of the tests.
- C. The Contractor shall provide technical input to the Commissioning Authority as needed during the development of the final project FPTs.
- D. Example FPTs are provided as illustration to the Contractor of the level of detail to which FPTs will be conducted.

1.03 Related Work and Documents

- A. Commissioning Plan: The Cx Plan is part of the Contract Documents and outlines many of responsibilities, procedures and tasks throughout the commissioning process. It encompasses the entire commissioning process including phases prior to construction and roles of all commissioning team members. It also describes the Functional Performance Tests that will be performed during the Acceptance Phase.
- B. Section 01 91 13: Specifies the general facility commissioning procedures common across all Divisions and the Contractor's responsibilities for the commissioning process.
- C. Section 23 08 59 – Instrumentation and Control Systems Commissioning: Details the commissioning procedures specific to the ATC/EMS System.
- D. Section 23 08 00 – Mechanical Systems Commissioning: Details the commissioning procedures specific to Division 15 work.
- E. Individual Specification Sections: Individual sections stipulate installation, start-up, warranty, O&M documentation, and training requirements for the system or device specified in the Section.

1.04 Definitions and Abbreviations

- A. Refer to Section 01 91 13.

1.05 Functional Performance Testing

- A. Objectives and Scope: Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response in the sequence of operations. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested
 - 1. Normal Operation: Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response in the sequence of operations. These series of tests will demonstrate that the systems and equipment operate throughout typical operation including normal adjusting, cleaning, media replacement, and maintenance.

2. **Abnormal Operation:** Test each system to simulate possible abnormal conditions and verify proper responses to such modes and conditions as power failure, equipment and component failure, freeze condition, deviation of operating parameters outside of normal, no flow, supporting utility failure, human error, etc. This series of tests shall demonstrate proper and safe response to the tested systems and the other systems that it affects or with which it integrates. These tests shall also demonstrate proper alarming of abnormal conditions to quickly and effectively notify users and operators of such condition. Specific modes required in this project are given in this section and any other sections where test requirements are found.
- B. **Development of Test Procedures.** The Commissioning Authority shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the Commissioning Authority shall provide a copy of the test procedures to the Contractor who shall review the tests for feasibility, safety, equipment and warranty protection, and scope. The Commissioning Authority will also submit the tests to the A/E for review.
 1. Contractor shall review the FPTs in detail and approve them.
 2. The Commissioning Authority shall review Owner-contracted testing, factory testing, or required Owner acceptance tests for which the Commissioning Authority is not responsible to oversee. Review shall include content, scope, and documentation format, and shall determine what further testing or format changes may be required. Redundancy of testing shall be minimized.
 3. The purpose of any given specific FPT is to verify and document compliance with the stated criteria of acceptance.
- C. **Scheduling:** After Contractor's notification that systems are ready for functional testing and review of all the required submittals has occurred, the Construction Manager shall schedule the testing. To the extent practical, tests shall be scheduled to allow efficient and contiguous testing of inter-related systems and equipment.
- D. **Participation:** The Commissioning Authority will direct and conduct functional performance tests after Start-Up Procedure and Pre-Functional Checklist documentation of systems and equipment have been reviewed and accepted. Conceptual procedures for the functional performance testing are outlined elsewhere in this Section. The Commissioning Authority will execute the FPTs unless otherwise specified. The Contractor shall assist as described above with manipulation of the systems or equipment, provision of supporting equipment or materials (lifts, ladders, specialty test equipment, safety equipment), and on-the-spot remediation of minor identified deficiencies whenever possible. Required participation is outlined in the generic FPTs provided elsewhere in this Section.
 1. Required participating Parties shall be indicated with the individual FPT. Typically, multiple Parties are required for any given test, yet participation for any given Party is only required for the respective portion of the test for which the Party is responsible.
 2. On multiple samples where a given Party does not directly conduct the test, the participation of that Party will only be required for an initial quantity of systems/equipment. Whenever practical and at the discretion of the Commissioning Authority, the Commissioning Authority will continue with the remaining portion of the sample without assistance from the Contractor. The Contractor is allowed to be present at their option for any or all FPTs conducted.
 3. It is required that the required Parties be available on-site throughout the testing of any given system for which they are required participants. Therefore, time for which they are not directly involved can be spent performing other work (typically addressing identified punch list items or failed tests).
 4. No Party involved with the project is prohibited from participation in or witnessing of any tests. Any Contractor may elect to witness all tests on their systems even if their involvement is not directly.
 5. The Commissioning Authority will endeavor to coordinate effectively with the individual Contractors throughout FPTs and minimize their required involvement.
 6. Contractor assumes responsibility for damage to systems conducted in accordance with the approved procedures.

- E. Detailed Test Procedures and Contractor Review: The Commissioning Authority will prepare detailed and itemized testing procedures to define and document the FPTs. These will be developed during the Construction Phase and completed during the Acceptance Phase. The Commissioning Authority shall submit these procedures to the Contractor for review. Contractor shall indicate all required limitations, safety procedures, maximum thresholds, and any other parameters during the FPT development. Contractor shall be responsible for any damage to the equipment caused by functional performance testing done per the procedures and within the limitations of the approved procedures.
- F. Completeness: All systems must be completed and ready for FPT. All start up, factory authorized field testing, independent testing agency tests, and TAB procedures must be complete, and the control systems must be tested and started for the respective system or component.
- G. Test Documentation: Commissioning Authority will conduct tests, and/or witness tests as applicable. Commissioning Authority will record all test results on the forms developed for the testing. Commissioning Authority will 'Pass' or 'Fail' the testing and record the date and time of the test. Deficiencies shall clearly be indicated when the test is failed. When all related testing is completed successfully, Commissioning Authority shall recommend acceptance of the system or component.
- H. Deficiencies and Re-Testing: When deficiencies are identified during testing, depending on their extent or magnitude, they can be corrected during the test and the testing can continue to successful completion. More significant deficiencies will require failure of the test and re-testing. Deficiencies of this magnitude will result in an Action Item on the Action List. The resolution of the deficiency will then subsequently be tracked by the Commissioning Authority via the Action List. All tests shall be repeated until successful completion. Refer to more specific provisions below.
- I. Sampling: Some types of identical equipment (such as terminal devices) will be tested using a sampling strategy. The sample percentage is indicated in the Commissioning Plan.
- J. Max Failure Limit and Sample Percentages: A Maximum Failure Limit is indicated along with the Sampling Percentages. The Max Failure Limit indicates the maximum percentage of the tested devices that may have any test that fails before an entirely new sample must be tested. This is based on the concept that if many failures occur, it is a result of inadequate start-up by the Contractor. When the maximum number of failures is reached, testing on that sample will be terminated and re-testing will be scheduled.
 - 1. If no Max Failure Limit is indicated, all tested samples must pass (Max Failure Limit 0%).
 - 2. Where sample tests involve multiple systems (i.e., checking strainers on different hydronic systems) the Maximum Failure Limit will apply per system.
 - 3. The responsible Contractors shall pay the Commissioning Authority cost of that sample test and redo the start-up/TAB for the applicable devices/systems.
 - 4. All work necessitated by sample failures shall be at no cost to the Owner.
- K. Opposite Season Testing: Testing procedures shall be repeated and/or conducted as necessary during appropriate seasons. Opposite Season testing will be required where scheduling prohibits thorough testing in all modes of operation. Air handler and central heating system testing for heating-related modes of operation and control loops shall be tested during outside air temperatures below 35°F.
- L. Approval: The Commissioning Authority passes each test and subsequently recommends acceptance to Owner or Construction Manager who reviews and accepts the results of the FPT.

1.06 Coordination Between Testing Parties.

- A. Factory Start-Ups: For many systems and equipment, Factory Start-Ups are specified. These Factory Start-Ups will be reviewed and checked during functional performance testing. All costs associated with the Factory Start-Ups are included with the bid unless otherwise noted. In general, Contractor shall make notification of when Factory Start-Ups are occurring and coordinate these with witnessing Parties. The Commissioning Authority and commissioning team members may witness Factory Start-Ups at their discretion. Aspects of functional

performance testing accomplished during the Factory Start-Ups may be accomplished and approved by the Commissioning Authority if they meet the intent of the FPT.

- B. Independent Testing Agencies: For systems where Independent Testing Agencies are specified, the cost of this testing is included with the bid unless otherwise noted. Much of the testing performed by these independent agencies will cover aspects required in the Start-Up Procedures and functional performance tests.
 - 1. Contractor and testing agencies shall coordinate with the Commissioning Authority so that the Commissioning Authority can witness the testing and approve the applicable aspects of the FPTs.
 - 2. The Commissioning Authority may in some cases independently spot-check work of the testing agencies if the tests were not witnessed. However, it is not the intent for the Commissioning Authority to re-accomplish testing by others that is specified in the construction specifications.
 - 3. Contractor is responsible for coordinating the efforts of testing agency with that of the commissioning process. Documentation shall be contiguous and seamless, and duplication should be avoided. Testing agencies shall complete the documentation of the commissioning process as required.
- C. Specialized Testing by Contractor: Where specialized testing is specified in the technical specifications, Contractor, subcontractor, vendor, or factory representative as applicable shall conduct the specified testing and provide all specialized instrumentation and equipment. Commissioning Authority and other commissioning team members may witness tests at their discretion. The Commissioning Authority may in some cases independently spot-check the results of the tests if the tests were not witnessed. However, it is not the intent for the Commissioning Authority to re-accomplish testing that is specified in the construction specifications. All specialized testing procedures shall be integrated with the Cx process and all documentation shall be coordinated and integrated with the documentation of the Cx process. Examples of specialized testing include:
 - 1. Generator load testing (not building power outage functional testing which will be administered by Commissioning Authority)
 - 2. Acceptance testing of the Fire Alarm System
 - 3. Fire suppression system hydraulic tests
 - 4. Laboratory Gas Cross Connection testing
 - 5. Uninterruptible Power Supply
 - 6. Fume Hood Acceptance Testing
 - 7. Electrical System Testing per NETA
 - 8. Room Leakage Testing
 - 9. Room Pressure Decay Testing

1.07 FUNCTIONAL PERFORMANCE TEST ACCEPTANCE CRITERIA

- A. The Acceptance Criteria shall be as follows unless more specifically indicated within individual tests. Commissioning Authority may exercise professional judgment to relax requirements and pass tests and recommend approval when appropriate.
 - 1. Capacity and/or equipment performance will generally be as specified $\pm 5\%$.
 - 2. Efficiency where specifically indicated in the documents will be $\pm 5\%$. When inferred from manufacturer's catalogue data, criteria will be $\pm 10\%$.
 - 3. Balancing-related criteria will be $\pm 5\%$ for water and $\pm 10\%$ for air.
 - 4. Accuracy/repeatability on sensing devices will be as specified for the device. Commissioning Authority and TAB will use calibrated gages for independent validation and use judgment in passing or failing the devices. In many cases, the coordination of multiple related sensors is more important than absolute accuracy.
 - 5. Loop response and set point deviation criteria will be as specified in Section 23 08 59.
 - 6. HVAC sequence-related criteria will be as explicitly specified in the documents and as interpreted by the Commissioning Authority. Code required sequencing shall be per the applicable code.
 - 7. System sequences shall be as required by the approved shop drawings.
 - 8. Motor Phase Imbalance: Shall be no more than 2% (Amps and Volts).

9. Noise Levels:
 - a) Occupied spaces: As indicated in the Basis of Design document. Otherwise, noise level shall be as recommended in the most current version of the ASHRAE Handbooks for the applicable occupancy.
 - b) At limits of the enterprise or facility: As required by current local ordinances.
10. Indoor Environmental Parameters (T, RH, CO₂, VOC): Shall be as indicated in the Basis of Design document. Otherwise, as recommended in the most current version of the ASHRAE Handbooks for the applicable occupancy.
11. Air Pressurization: As indicated in the Basis of Design document. Otherwise, as indicated in the most current version of the ASHRAE Handbooks for the applicable occupancy. Smoke/shaft pressurization shall be as required by NFPA to maintain maximum door opening forces and to restrict the passage of smoke.
12. Indoor Lighting Levels: As indicated in the Basis of Design document. Otherwise, as recommended in the most current version of the IES Handbooks for the applicable occupancy.
13. Electrical Systems: Shall be in accordance with manufacturer's recommendations of individual components and devices, NFPA 70B and International Electrical Testing Association (NETA) testing specifications NETA ATS-Latest Version.
14. Inter-system interfaces and coordination: as specified and generally to ensure safe, reliable, and robust operation.

PART II – PRODUCTS

2.01 INSTRUMENTATION

- A. General: All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available. Supplier of instrumentation shall submit the calibration certificates along with the startup documentation.
- B. Standard Testing Instrumentation: Standard instrumentation normally used for performance assessment and diagnosis will be provided by the Commissioning Authority for tests being conducted by Commissioning Authority. All other instrumentation shall be provided by the Contractor. The instrumentation to be provided by the Commissioning Authority includes:
 1. Electronic Manometer (for Air and Flow Hood)
 2. Electronic Manometer (for Water)
 3. Temperature Instruments and Gages
 4. Humidity Instrument and Gage
 5. Sound Meter
 6. Light Level Meter
 7. Electronic Multimeter
 8. Receptacle Tester
- C. Special Tools: Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and provided to the Owner.

Part III – FUNCTIONAL PERFORMANCE TESTS (SYSTEMS AND EQUIPMENT RELATED)

3.01 PREREQUISITES

- A. All equipment, components, and devices applicable to the FPT must be started and the Start-Up must be documented and passed. This includes completion of Pre-Functional Checklists, Start-Up Procedures, pressure testing of equipment, duct, piping; flushing/cleaning of applicable systems; completed labeling and identification; completed insulation of applicable systems; and all other requirements for placing system into dynamic operation.

- B. Unless specifically agreed to by the Owner and Commissioning Authority, all support systems shall be complete prior to FPT. These support systems may include, but not be limited to the following:
 - 1. The electrical system serving the equipment is completed and tested;
 - 2. The hydronic systems serving the equipment have been pressure tested, flushed, and functional performance tested;
 - 3. Balancing has been accomplished on the air and water sides;
 - 4. The control systems have been started up and calibrated.
- C. The Commissioning Authority shall determine the optimal sequence of testing.

3.02 FUNCTIONAL TESTING PROCESS

- A. Functional Testing on any given system shall begin with testing sensing elements such as temperature, pressure and status. The next level will be major components of a system such as valves, dampers and pumps. The next level will be the system with all applicable modes and failure scenarios. The final level will be an integrated test of building performance.
- B. Functional Testing of systems will proceed from the main central systems such as chiller and boilers, to the distribution systems such as secondary pumping and air handling units, to the zone terminal units. Commissioning Authority shall plan this process with the Construction Manager. Construction Manager shall reflect that process in the Construction Schedule. Subcontractors shall perform work in accordance with the schedule.

3.03 COMMON ELEMENTS FOR ALL SYSTEMS

- A. Required submittal documentation shall be present and located convenient to testing area. Validate that all required documentation has been submitted and is per the contract requirements.
- B. Contractor shall provide the completed Start-Up Procedures prior to the time of testing. Commissioning Authority shall review the Start-Up Procedure documentation and spot-check prior to the beginning of FPT.
- C. Contractor shall demonstrate that access is sufficient to perform required maintenance.
- D. ATC/EMS trends shall have been established as required in the documents. These shall be reviewed prior to or during FPT.
- E. All dynamic systems powered by electricity shall be tested to simulate a power outage to ensure proper sequencing. Those on emergency power or uninterruptible power shall be tested on all sources.
- F. Capacities and adjusted/balanced conditions as applicable shall be subject to verification.
- G. All modes of operation and actions shall be verified for equipment/system samples to verify sequencing.
- H. System and equipment configurations shall be compared against the contract documents.
- I. Verify functions (such as heating and cooling) are coordinated and do not overlap.
- J. All systems adjusted and balanced by the TAB contractor and controlled by the ATC/EMS shall be assessed to determine the optimal setting for the system as applicable. The optimal settings should be determined to establish reliable, efficient, safe and stable operation.
- K. The graphic displays for all components, systems, and areas required to be represented by a graphic shall be checked for adequacy and accuracy. When set points or other parameters are required to be adjustable, Commissioning Authority shall verify that they can be adjusted directly from the graphic screen.
- L. Emergency power tests for mechanical systems will be conducted in concert with the testing of the emergency power systems. Mechanical contractor shall be available for the power outage test to test mechanical systems under a power outage. This is in addition to the requirements specified for the mechanical system.
- M. Where system and zones are designed for various modes of operations and are indicated as such, test representative systems in all modes of operation. This includes, but is not limited to the following modes:
 - 1. Seasonal Modes
 - 2. Sequencing Modes
 - 3. Emergency Modes

3.04 TAB VERIFICATION OF MECHANICAL SYSTEMS

- A. Commissioning Authority shall review TAB reports.
- B. Participants shall include: Commissioning Authority, Owner's Representative, and TAB.
- C. The Commissioning Authority will select up to 10% of the readings from the Balancing Reports and spot-check them. The maximum failure rate for this sample is 10% and the system shall be re-balanced and re-documented if this rate is exceeded. The readings selected by the Commissioning Authority may include supply air diffuser readings (both minimum and maximum readings for VAV boxes), main and branch supply duct traverse readings, outside/return air flow readings, exhaust air flow readings, water flow readings, amp readings, and water pressure drop readings through coils, heat exchangers, and other hydronic elements. For all readings a deviation of more than what is allowed in the TAB specification 23 05 93 between the verification reading and reported data shall be considered as failing the FPT. All readings that fail the FPT shall require re-balancing.

3.05 VARIABLE SPEED DRIVES

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, ATC/EMS, and Electrical Contractor. Additional time is generally included with the systems that include the drives.
- B. Commissioning Authority shall review Start-Up Procedure.
- C. Verify the overload protection.
- D. Test the operation of the controller local and remote start/stop and speed control. Spot-check insulation resistance on the controller bus and control circuits.
- E. Validate setup parameters are coordinated with motor application.
- F. Validate Acceleration and Deceleration Rates on start and stop.
- G. Verify ranging of control input and coordination with that displayed on Operator Interfaces.
- H. Verify 'Bypass' functionality where applicable
- I. Verify restart after power outage.
- J. Verify any Skip Frequencies.
- K. Verify alarming and shutdown sequences.
- L. Conduct insulation resistance, short circuit, and ground tests of motors.

3.06 AIR HANDLING UNITS AND ROOFTOP UNITS

- A. Participants shall include: Commissioning Authority, Equipment Manufacturer, Mechanical Contractor, and ATC/EMS.
- B. Sample: 100%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan and open/close of outdoor air damper.
- E. Start heating and cooling systems; manipulate control device to obtain maximum cooling and heating. Measure temperatures and pressures to determine capacity.
- F. Weather permitting, cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- G. Check calibration of control devices and for stable control response and component performance including chilled water coils, hot water coils, economizer cycles, and others. Ensure proper coordination of control loops and that no fighting or energy wastes result.
- H. Verify operation of the enthalpy wheels (AHU only)
 - 1. Inspect the installation visually for proper rotation and seal and undamaged media.
 - 2. Check cross contamination and re-entrainment testing results are done under the applicable section.
 - 3. Check the full sensible and latent recovery efficiency at peak summer conditions.
 - 4. With different weather conditions, check the mode of control. In winter, check the discharge loop control and make sure sensors are calibrated and that heating does not overshoot and require cooling. In mild conditions, ensure minimum rotation/recovery. In summer conditions, ensure maximum recovery.
 - 5. Check the frost protection override control loop.
 - 6. Test operation during power outage in the context of the associated air handler.

- I. Check for free and adequate flow of condensate.
- J. For variable speed fans, manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions. Manually ramp fan speed from minimum to maximum to ensure stable operation of fans. Record representative part load output from the drive. Check calibration of control input. Check drive bypass operation if applicable.
- K. Ensure minimum required ventilation rates are maintained across the full range of control (where applicable).
- L. Test all interfaces with the fire alarm system and all smoke control sequences.
- M. Verify interlocks with exhaust fans where applicable.
- N. Test proof alarming where applicable.
- O. Test operation of applicable safeties including freezestats, high and low static devices, smoke detection, duct humidity, and others. Check AHU component status in each event.
- P. Check system status and operation in the Off, Unoccupied, and Occupied modes of operation. Validate proper start up and shut down sequences.
- Q. Test all Fireman Control and Override sequences.
- R. Simulate power outage and ensure automatic and orderly restart.

3.07 EXHAUST AND SUPPLY FANS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, and ATC/EMS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan.
- E. Check the capacity of the fan at maximum conditions.
- F. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- G. Verify interlocks with AHUs and RTUs where applicable.
- H. Test all interfaces with the fire alarm system and all smoke control sequences.
- I. Test proof alarming where applicable.
- J. Simulate failures of fans and ensure proper start-up of backup fans.
- K. Test operation of applicable safeties including high and low static devices, smoke detection, and others.
- L. Simulate power outage and ensure automatic and orderly restart.

3.08 DUCTLESS SPLIT SYSTEMS

- A. Participants shall include: Commissioning Authority, Equipment Manufacturer, Mechanical Contractor, and ATC/EMS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan.
- E. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode. Minimum modes shall include:
 - 1. Full Cooling
 - 2. Full Heating
- F. Check proper operation and charge of refrigerant circuit.
- G. Confirm compressor cycling is within allowable frequency
- H. Confirm refrigerant piping is installed for adequate oil return
- I. Check calibration of control devices and for stable control response and component performance including chilled water coils, electric reheat coils, humidifiers, and others. Ensure proper coordination of control loops and that no fighting or energy wastes result.
- J. Check for free and adequate flow of condensate.
- K. Check for adequate air distribution.
- L. Test all interfaces with the fire alarm system and all smoke control sequences.
- M. Test proof alarming. Where applicable, verify interface between unit packaged controls and ATC/EMS.

- N. Check system status and operation in the Off, Unoccupied, and Occupied modes of operation. Validate proper start up and shut down sequences.
- O. Simulate power outage and ensure automatic and orderly restart.
- P. In winter, verify operation of low ambient heat rejection control of DX circuit

3.09 VARIABLE REFRIGERANT TERMINAL UNITS

- A. Participants shall include: Commissioning Authority, Equipment Manufacturer, Mechanical Contractor, and ATC/EMS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Check the calibration of zone temperature sensors.
- E. Verify the operation of the air-cooled condensing unit.
- F. Check the stability of the zone temperature control loop for the damper and any associated heating devices by changing the space set points and observing the response.
- G. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- H. Determine the optimal settings for the control parameters
- I. Simulate and test the unoccupied and emergency mode response of the terminal unit where applicable.
- J. Check the capacity of the heating device where applicable.

3.10 BUILDING AUTOMATION SYSTEM

- A. Participants shall include: Commissioning Authority and ATC/EMS.
- B. Refer also to Section 23 08 59 for ATC/EMS Commissioning requirements.
- C. Commissioning Authority shall review Start-Up Procedure.
- D. Controls system sampling will typically correspond to the sampling rate of a system or piece of equipment. These sampling rates are indicated above for the respective item.
- E. Operate the equipment and subsystems through all specified modes of control and sequences of operation including full and part load conditions, and emergency conditions.
- F. Verify that equipment operates in accordance with design intent and approved control diagrams. This shall include checking the operation of dampers, valves, smoke detectors, high and low limit controls, of a sample of 25% of components with a maximum failure limit of 10%.
- G. Analog Input (AI) Sensors: Sample rate of 50% of the inputs on the sampled devices will be used with a maximum failure rate of 10%. Spot-check AI sensors (space temperature sensors, outside, return, and mixed air temperature sensors, discharge air temperature sensors, chilled water and hot water temperature sensors, and humidity sensors, air and water differential pressure sensors, airflow monitoring stations, etc.) for specified accuracy.
- H. Analog Outputs - Valves, Dampers and Actuators: Sample rate of 50% of the inputs on the sampled devices will be used with a maximum failure rate of 10%. Ensure that the valves and dampers modulate freely and their actuator's close-off or seal against the maximum pressure differential. Ensure that the actuators stroke throughout the correct range (correlated with the programmed range) under operations pressures anticipated and that the positioners are set correctly where applicable.
- I. Establish trends of control system points for a minimum of a two-week period prior to and throughout the Acceptance period. Trends shall be analyzed to identify any control problems, lack of capacity, control loops fighting or unstable or other operational anomalies.
- J. Automatic Switches: Spot-check (at a sample of 50% of the inputs on the sampled devices with a maximum failure rate of 10%) the operation of all automatic switches (pressure switches, current switches, flow switches, and others) to ensure that they are adjusted to proper make and break settings.
- K. Verify the standalone functionality of the controllers. Disconnect LAN communication wiring and ensure that the controller functions properly and that the loss of communication is acknowledged by the interface. Restore communications and ensure an orderly restoration to normal control.

- L. Verify that the ATC/EMS interface, ATC/EMS software, graphics and functions are in accordance with design intent and approved control diagrams.
- M. Check dial-in communications and internet access where applicable to ensure functionality.

3.11 LIGHTING AND LIGHTING CONTROL SYSTEM

- A. Participants shall include: Commissioning Authority, Equipment Manufacturer, and Electrical Contractor.
- B. Sample: 100%, Failure Limit 10%
- C. Review Factory-Certified Start-Up Tests. Commissioning agent may opt to attend demonstration of lighting controls.
- D. Verify occupancy sensor placement and test reliability of activation/deactivation.
- E. Test photocells for functionality and accuracy.
- F. Spot-check switches to ensure proper operation and circuiting.
- G. Spot-check lighting levels to ensure compliance with IES and/or the design requirements for the respective occupancy.
- H. Test operation of daylight dimming control system if applicable. Insure lights are banked parallel to the daylight source.

- END OF SECTION 01 19 15 -

SECTION 01 22 00 UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Division 1 Section "Payment Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. A Unit price is an Owner-established amount stated on the following Schedule of Unit Prices to be used as a price per unit of measurement for referenced materials or services added to or deducted from the Contract by appropriate Contract Modification. Unit prices are applicable for change order work only and are not utilized in the Base Bid work.
- B. By submitting a bid, the Contractor acknowledges acceptance of the established Unit Prices for their use in determining the value of change work. Prices as stated will remain in effect until final completion of the Contract.
- C. Performance of Work not authorized by a Change Order or Field Order, whether or not such work is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment beyond the Contract Sum. The Schedule of Unit prices has no impact, effect, or role on Base Contract Work.

1.4 PROCEDURES

- A. Unit prices include all Contractor cost/credit for indicated unit of work including, but not limited to costs for: material, labor, tools, equipment, delivery, handling, protection, supervision, installation, testing, insurance, bond, taxes, overhead, and profit.
- B. Measurement and Payment: Contractor shall be responsible for measurement of Change Order work performed utilizing unit prices; however, the Contractor must notify the Architect/Engineer and Owner in sufficient time prior to commencing this work to allow proper Owner monitoring of any measurements. Only quantities which have been approved in writing by the Owner will be considered in any Contract Modification. Payment for change work will be per Division 1 Section "Contract Modification Procedures".
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor.
- D. All change work performed utilizing unit prices shall be done per Contract Documents. Unit prices are for work in place, unless noted otherwise.
- E. Schedule of Unit Prices: A Schedule of unit prices which shall apply to this contract is included in the Bid Form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION 01 22 00 -

**SECTION 01 23 00
ALTERNATES**

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Definitions and Explanations: "Alternates" are defined as alternate products, materials, equipment systems, methods, units of work for major elements of construction, which may, at Owner's option be selected for work in lieu of corresponding requirements of Contract Documents.
 - 1. Alternates may or may not change scope and general character of work substantially.
- B. Accepted Alternates: Refer to Construction Contract and subsequent modifications thereof (if any) for determination of which alternates listed have been accepted, and are, therefore, in full force and effect as though originally included in Contract Documents for base bid.
- C. Notification: Immediately following award of contract, prepare and distribute to each entity or person to be involved in performance of work, notification of status of each alternate scheduled and including those subsequently added by notification during bidding. Indicate which alternates have been: 1) accepted, 2) rejected, and 3) deferred for consideration at later date as indicated. Include full description of negotiated modifications to alternates, if any.
- D. Requirements of the General Conditions, Supplementary Conditions and Division 1 of these specifications apply to this section.
- E. The work under these Alternates shall be performed in accordance with the applicable Sections of these specifications.

1.2 GENERAL ALTERNATE REQUIREMENTS

- A. General: Description for each alternate is recognized to be incomplete and abbreviated but implies that each change must be complete for scope of work affected. Refer to applicable sections (Divisions 2 through 33) and to applicable Drawings for specific requirements of each alternate. Coordinate related requirements among sections of Specifications as required. Modify surrounding work as required to integrate with work of each alternate.

1.3 ALTERNATE DESCRIPTIONS

- A. Alternate #1 (Additive) – Parks and Recreation Gymnasium Expansion:

The base bid scope includes a smaller size gymnasium and does not include any additional areas for the Parks and Recreation Gymnasium program. The add alternate includes construction of a larger space for Gymnasium 900, and includes construction of rooms 900A and 908 through 915. The alternate includes all site, architectural, structural, mechanical, electrical, plumbing, and telecommunications work associated with construction of these areas.

- B. Alternate #2 (Additive) – Alternative Specialized Education Wing:

This alternate includes construction of the Alternative Specialized Education wing, which is located to the north of column line 26. It includes rooms A101 through A115, along with Vestibule 006 and Corridors 004, 005, and 007.

C. Alternate #3 (Additive) – Greenhouse:

The base bid does not include a Greenhouse. The add alternate includes the addition of a Greenhouse and all associated equipment, including foundations, slabs, exterior walls, and mechanical, fire protection, electrical, and plumbing systems.

D. Alternate #4 (Additive) – Middle School Classroom Wing and addition of Shared Learning Spaces:

The base bid does not include construction of the Middle School Classroom wing. The add alternate includes construction of the Middle School wing, which contains Rooms D101 through D108 and Corridor 019. It also includes conversion of typical Classrooms B105 and E103, Storage Rooms B105A and E103A, and Toilet Rooms B105B and E103B into Shared Learnings B105 and E103, Personal Cares B103 and E106, and Seclusions B104 and E105.

E. Alternate #5 (Additive) – Security Doors and Frames with Ballistic Resistant Glazing at the Main Entrance:

The base bid includes standard aluminum storefront entrance doors and frames with standard insulated glazing (exterior) or standard tempered glazing (interior) at the main entrance area. The add alternate includes revision of doors and frames to security doors and frames and glazing to ballistic-resistant type at the main entrance.

F. Alternate #6 (Additive) – Terrazzo Flooring at Commons 002:

The base bid includes VCT flooring at Commons 002. The add alternate includes upgrade of VCT to terrazzo flooring. Note that the floor pattern indicated for Commons 002 shall be provided for both the base bid VCT installation and the add alternate terrazzo installation.

G. Alternate #7 (Additive) – Quartz Tile Flooring in lieu of VCT Flooring:

The base bid includes VCT flooring at base bid areas as noted on the finish schedule. The add alternate includes revision of all scheduled VCT flooring to Quartz Tile flooring at all base bid areas.

H. Alternate #7.1 (Additive) – Quartz Tile Flooring in lieu of VCT Flooring | Alternate #1:

The base bid includes VCT flooring as noted on the finish schedule for Alternate #1, Parks & Rec Gymnasium. The add alternate includes revision of all scheduled VCT flooring to Quartz Tile flooring at all Alternate #1 areas.

I. Alternate #7.2 (Additive) – Quartz Tile Flooring in lieu of VCT Flooring | Alternate #2:

The base bid includes VCT flooring as noted on the finish schedule for Alternate #2, Alternative Specialized Education Wing. The add alternate includes revision of all scheduled VCT flooring to Quartz Tile flooring at all Alternate #2 areas.

J. Alternate #7.4 (Additive) – Quartz Tile Flooring in lieu of VCT Flooring | Alternate #4:

The base bid includes VCT flooring as noted on the finish schedule for Alternate #4, Middle School Classroom Wing and addition of Shared Learning Spaces. The

add alternate includes revision of all scheduled VCT flooring to Quartz Tile flooring at all Alternate #4 areas.

K. Alternate #8 (Additive) – Modification to Underslab Sanitary Piping Materials

The base bid includes the use of PVC piping for underslab sanitary systems at all base bid building areas. The add alternate includes revision of PVC piping to cast iron piping for all underslab sanitary systems at base bid building areas.

L. Alternate #8.1 (Additive) – Modification to Underslab Sanitary Piping Materials | Alternate #1:

Alternate #1, Parks and Recreation Gymnasium Expansion, includes the use of PVC piping for underslab sanitary systems. This add alternate includes revision of PVC piping to cast iron piping for all underslab sanitary systems at all Alternate #1 areas.

M. Alternate #8.2 (Additive) – Modification to Underslab Sanitary Piping Materials | Alternate #2:

Alternate #2, Alternative Specialized Education Wing, includes the use of PVC piping for underslab sanitary systems. This add alternate includes revision of PVC piping to cast iron piping for all underslab sanitary systems at all Alternate #2 areas.

N. Alternate #8.3 (Additive) – Modification to Underslab Sanitary Piping Materials | Alternate #3:

Alternate #3, Greenhouse, includes the use of PVC piping for underslab sanitary systems. This add alternate includes revision of PVC piping to cast iron piping for all underslab sanitary systems at all Alternate #3 areas.

O. Alternate #8.4 (Additive) – Modification to Underslab Sanitary Piping Materials | Alternate #4:

Alternate #4, Middle School Classroom Wing and addition of Shared Learning Spaces, includes the use of PVC piping for underslab sanitary systems. This add alternate includes revision of PVC piping to cast iron piping for all underslab sanitary systems at all Alternate #4 areas.

P. Alternate #9 (Additive) – Addition of Fire Pump

The base bid should assume that no fire pump is required. Pipe sizes and system design should be priced accordingly to function without the need for a pump. The add alternate includes the cost associated with the addition of a fire pump. The fire pump shall be sized for the ultimate square footage of the facility, including all alternates and the future expansion wing.

Q. Alternate #10 (Additive) – HVAC Maintenance Service Agreement

The base bid does not include a maintenance service agreement for HVAC equipment. The add alternate includes the addition of a five-year maintenance service agreement for all of the air-handling equipment, the VRF system, and the pool HVAC unit that serves the base bid spaces.

- R. Alternate #10.1 (Additive) – HVAC Maintenance Service Agreement | Alternate #1:

Alternate #1, Parks and Recreation Gymnasium Expansion, does not include a maintenance service agreement for HVAC equipment. This add alternate includes the addition of a five-year maintenance service agreement for all of the air-handling equipment and the VRF system that serves the Alternate #1 spaces.

- S. Alternate #10.2 (Additive) – HVAC Maintenance Service Agreement | Alternate #2:

Alternate #2 does not include a maintenance service agreement for HVAC equipment. This add alternate includes the addition of a five-year maintenance service agreement for all of the air-handling equipment and the VRF system that serves the Alternate #2 spaces.

- T. Alternate #10.3 (Additive) – HVAC Maintenance Service Agreement | Alternate #3:

Alternate #3, Greenhouse, does not include a maintenance service agreement for HVAC equipment. This add alternate includes the addition of a five-year maintenance service agreement for all of the HVAC equipment that serves the Alternate #3 spaces.

- U. Alternate #10.4 (Additive) – HVAC Maintenance Service Agreement | Alternate #4:

Alternate #4, Middle School Classroom Wing and addition of Shared Learning Spaces, does not include a maintenance service agreement for HVAC equipment. This add alternate includes the addition of a five-year maintenance service agreement for all of the air-handling equipment and the VRF system that serves the Alternate #4 spaces.

- END OF SECTION 01 23 00 -

**SECTION 01 29 00
PAYMENT PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor, and approved by the Architect/Engineer and the Owner, allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing and processing Contractor's Applications for Payment.

1.4 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.
 - 2. Submit the Schedule of Values to Architect/Engineer and Owner for approval within ten (10) days after issuance of Notice to Proceed and at least seven (7) days before initial requisition for payment. The Schedule of Values must be approved prior to approval of contractor's initial requisition for payment.
 - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: The breakdown values in the Schedule of Values must be true and accurate and consistent with actual project costs incurred. Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect/Engineer.
 - c. Architect/Engineer's project number.
 - d. Contractor's name and address.

- e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value; and percentage of the Contract Sum to nearest one-hundredth percent adjusted to total 100 percent.
 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.
 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site; see 1.4.C below.
 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 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. Major temporary facilities and other overhead cost items that are not a direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 9. Schedule Updating: Update the Schedule of Values before each Application for Payment when Change Orders and/or Contract Amendments result in a change in the Contract Sum. Field Orders do not change the Contract Sum and should not be listed in the Schedule of Values.
- C. Off-Site Storage: Payment will not be made for materials and equipment stored off the site, except at Owner's sole discretion and prior approval. In general, material stored out of the County will not be approved for payment. If the Owner allows off-site storage, the corresponding Application shall be accompanied by:
1. Statement describing and quantifying the item(s) being stored,
 2. Statement certifying location of the bonded warehouse(s) where materials or equipment is being stored,
 3. Signed Affidavit of Storage,

4. Certificate of Insurance,
5. Bill of Sale made to Owner and
6. Statement certifying that item, or any part thereof, will not be installed in any construction other than work under this Contract.

Any approved material stored offsite shall be made available for inspection by the Architect/Engineer or Owner prior to payment.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect/Engineer and paid for by Owner. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Monthly Applications for Payment:
 1. Payment Application Times: Unless noted otherwise, applications for payment shall be made monthly, near the end of each month. The period of construction work covered by each Application for Payment will usually be the preceding month. In order to expedite the review and approval of each application for payment, submit to and review with the Architect/Engineer and the Owner a draft (pencil copy) of each application for payment prior to submitting a formal copy.
 2. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as the forms for Applications for Payment. Equivalent forms will be considered at Contractor's request.
 3. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect/Engineer will return incomplete applications without action.
 - a. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - b. Include amounts of Change Orders issued before the last day of construction period covered by application.
 4. Transmittal: Submit two (2) signed and notarized original copies of each Application for Payment to Architect/Engineer by a method ensuring receipt within 24 hours. Upon Owner request, each application shall include Subcontractors' and Material Suppliers' waivers of liens. Provide required quality-control documentation and similar required documentation such as an updated Progress Schedule. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
 5. Waivers of Mechanic's Lien: Upon Owner request, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 6. Monthly Payment Application Packet:
 - a. Must include preliminary and monthly progress submittals for Building Product Disclosure and Optimization (BPDO) Calculator, Construction and Demolition Waste Management Plan and Indoor Air Quality Plan.
- C. 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 and suppliers.
 2. Approved Schedule of Values. Schedule of Values to be submitted to and approved by Architect/Engineer and Owner prior to submission of first application for payment.
 3. Products list.
 4. Submittals Schedule (preliminary if not final).
 5. List of Contractor's staff assignments and principal consultants.
 6. Copies of trade permits, authorizations and licenses from authorities having jurisdiction for performance of the Work.
- D. 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.
 3. Contractor's request for partial release of retainage at Substantial Completion should be made separately from progress application for payment.
- E. Modification Procedures
1. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
 2. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.
 3. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - a. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - b. Promptly execute the change.
 4. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.
 5. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.
 6. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - a. For changes requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

- b. For changes requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - c. For work involving pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - d. For changes ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- 7. Substantiation of Costs: Provide full information required for evaluation.
 - a. On request, provide following data:
 - i. Quantities of products, labor, and equipment.
 - ii. Taxes, insurance, and bonds.
 - iii. Overhead and profit.
 - iv. Credit for deletions from Contract, similarly documented.
 - b. Support each claim for additional costs with additional information:
 - i. Origin and date of claim.
 - ii. Dates and times work was performed, and by whom.
 - iii. Time records and wage rates paid.
 - iv. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - c. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- 8. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- 9. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- 10. Promptly enter changes in Project Record Documents.
- F. 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. Evidence of completion of all Project closeout requirements including completion of all punchlist items.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. All required warranties.
 - 4. Updated final statement, accounting for final changes to the Contract Sum.
 - 5. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 6. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 7. AIA Document G707, "Consent of Surety to Final Payment."
 - 8. Evidence that claims have been settled.
 - 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

10. Final liquidated damages settlement statement.
11. Certificate of Final Completion.
12. Certification of satisfaction/release of all Permits including the Storm Water Management Permit.
13. Removal of all temporary facilities, utility service connections, surplus materials, rubbish and similar materials.
14. Completion of LEED Online documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION 01 29 00 -

**SECTION 01 33 00
SUBMITTAL PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Refer to Article 9 of the General Conditions of Contract for additional submittal requirements.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals required for performance of the Work. Construction Manager shall submit and receive final written Architect/Engineer approval for submittals required by the Contract Documents including as specified herein prior to proceeding with any work affected by the products, components or assemblies to be submitted.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Applicable Division 1 Sections for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Applicable Division 1 Sections for submitting schedules and reports, including Construction Manager's Construction Schedule and the Submittals Schedule.
 - 4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 5. Division 1 Section "Closeout Procedures" for submitting warranties, Record Documents and operation and maintenance manuals.
 - 6. Other Specification Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect/Engineer's responsive action.
- B. Informational Submittals: Written information that does not require Architect/Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. 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. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination and/or color selection. Architect/Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Do not submit any submittals for permit unless submittal has been approved by Architect/Engineer.
- B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation".
- C. Processing Time: Make submittals promptly in accordance with construction schedules, and in such sequence as to cause no delay. Make submittals far enough in advance to allow enough time for Contract and Architect/Engineer submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect/Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals (or resubmittals) enough in advance of the Work to permit processing.
1. Initial Review: Allow 10 business days for initial review of each submittal by Architect/Engineer, except for those listed below, which will require 15 business days. Allow additional time if coordination with subsequent submittals is required. Architect/Engineer will advise Construction Manager when a submittal being processed must be delayed for coordination.
 - a. 05 12 00 Structural Steel Framing
 - b. 05 21 00 Steel Joist Framing
 - c. 08 11 13 Hollow Metal Doors and Frames
 - d. 08 21 11 Flush Wood Doors
 - e. 08 41 13 Aluminum Entrances and Storefronts
 - f. 08 71 00 Door Hardware
 - g. 22 40 00 Plumbing Fixtures
 - h. All Division 23 and Division 26 Submittals
 2. Intermediate Review: If an intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 10 business days for review of each resubmittal, or 15 business days for those listed in item 1.a. above.
- D. Identification: Place a cover sheet or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on cover sheet or title block.
 2. Provide a space approximately 6 by 8 inches on cover sheet or beside title block to record Construction Manager's review, Contractor's review, CQC review, and markings and action taken by Architect/Engineer.
 3. Include the following information on cover sheet for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect/Engineer.
 - d. Name and address of Construction Manager.
 - e. Name and address of Contractor.
 - f. Name and address of subcontractor (as applicable).
 - g. Name and address of supplier.
 - h. Name of manufacturer.
 - i. Submittal number and other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
 - j. Number and title of appropriate Specification Section. Specifically indicate which item within the Specification Section each product is intended to fulfill (for instance, 06 10 00, 2.2, A.)
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, by drawing number as appropriate.
 - m. Other necessary identification.

- E. Submittals shall include information as necessary to indicate its compliance with Contract Documents, relationship to other work, and other information as specified, including:
 - 1. Identification of product or materials
 - 2. Relation to adjacent structures or materials
 - 3. Field dimensions, clearly identified as such
 - 4. Applicable standards, such as ASTM number
 - 5. Clear identification of submittal material previously submitted and its status.
- F. Deviations: Encircle and specifically identify deviations from the Contract Documents on submittals. Substitutions and "or equal" products may not be processed through the submittal review process. Architect's Engineer's action on shop drawings cannot change the Work in the Contract Documents.
- G. Construction Manager Review: Construction Manager shall review and approve all submittals for compliance with Contract Documents and field dimensions prior to submission to Architect/Engineer. Construction Manager's approval shall be noted on the label or title block. The Architect/Engineer will return, unreviewed, any submittal (or resubmittal) not bearing notation of the Construction Manager's approval.
- H. Submission: Unless noted otherwise by Design Professional(s) and/or Owner's Representative, submittals shall be transmitted electronically via e-mail. Larger files may be shared via file-sharing or FTP sites. Hard copies of all final approved submittals must be provided for record with the project closeout documents. See Division 1 Section "Closeout Procedures" for specific requirements.
- I. Additional Copies at final submittal: Unless additional copies are required for final submittal, and unless Architect/Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- J. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect/Engineer will return or discard submittals received from sources other than Contractor.
 - 1. Transmittal Form: Use CSI Form 12.1A, AIA G810, or equal.
 - 2. On an attached separate sheet, prepared on Construction Manager's letterhead, record relevant information, requests for data, revisions other than those requested by Architect/Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same cover sheet information as related submittal.
- K. Resubmittals: Make resubmittals in same form 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 including any changes which were other than those requested by Architect/Engineer.
 - 3. Resubmit submittals until they are marked "Approved" or "Approved as Noted".
- L. 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.
- M. Use for Construction: Use only final submittals with mark indicating "Approved" or "Approved as Noted" as reviewed by Architect/Engineer.

1.5 CONTRACTOR'S USE OF ARCHITECT/ENGINEER'S CAD FILES

- A. General: At Construction Manager's written request, copies of Architect/Engineer's CAD Drawing files will be provided to Construction Manager for Construction Manager's use in connection with Project, subject to the following conditions:
 - 1. Use form at the end of this Section to request transmission of CAD files.
 - 2. Allow one week for processing, shipping and handling after Architect/Engineer receives the file request.
 - 3. Architectural Floor Plans shall be made available for use as backgrounds for preparation of shop drawings. No other CAD Drawing files will be made available.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. 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 printed data are not suitable 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 written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring or piping diagrams showing factory-installed wiring or piping.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Test results by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 - o. Performance characteristics and capacities
 - p. Dimensions and clearances required.
 - q. LEED documentation.
 - 4. Submit Product Data before or concurrent with Samples.
 - 5. All product data submittals shall be transmitted electronically via e-mail. Larger files may be shared via file-sharing or FTP sites. Hard copies of all final approved submittals must be provided for record with the project closeout documents. See Division 1 Section "Closeout Procedures" for specific requirements.
- C. Shop Drawings: Prepare project-specific information, drawn accurately to scale, on original drawings. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Shop drawings shall be prepared by qualified detailer(s).
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.

- d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
 3. All shop drawings shall be submitted electronically via e-mail. Larger files may be shared via file-sharing or FTP sites. Hard copies of all final approved submittals must be provided for record with the project closeout documents. See Division 1 Section "Closeout Procedures" for specific requirements.
- D. Samples: Submit Samples (physical examples) of materials, equipment or work for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Submit full-sized fully fabricated Samples cured and finished as specified and physically identical with the proposed material or product. Submit Samples for actual dye lots or production runs as available.
 2. Samples shall include final treatments, such as "scotchguarding" or "fireproofing" where such treatments are a requirement on the actual product
 3. Submit Samples that contain multiple, related components such as accessories together in one submittal package.
 4. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample (including finish and composition)
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section
 - e. Location of intended use in the project.
 5. Unless specified otherwise, submit full range of manufacturer's applicable standard colors, textures and patterns for review.
 6. Size: Provide Samples of sufficient size to show:
 - a. All Salient features of the material or item, representative of the functional and aesthetic characteristics of the Product
 - b. The extremes of variation in color, texture, finish and construction to be expected in the installed work.
 - c. Functional characteristics of product or material, with integrally related parts and attachment devices.
 7. 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 the Construction Manager.
 8. 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/Engineer will return submittal with options selected.

9. 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/Engineer will retain two Sample sets; remainder will be returned.
 - 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.
- E. Submittals Schedule and Construction Photographs: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- F. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."
- G. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."
- H. Subcontractor 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. Use CSI Form 1.5A or approved equal. Include the following information in tabular form:
 1. Name, address, and telephone number 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.
 4. Number of Copies: Submit electronic copy, retain returned copy with approval as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Provide Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit electronic copies. Submit directly to Owner concurrently with submission to Architect/Engineer.
 2. Certificates and Certifications: Provide a notarized 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.
 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."
- C. Qualification Data: Provide written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Architect/Engineers and owners, and other information specified.

- D. Welding Certificates: Provide written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Provide 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.
- F. Manufacturer Certificates: Provide written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Provide written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Provide written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- I. Material Test Reports: Provide 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. Third-party Test Reports shall be submitted for all testing as indicated in Division 1 Section "Quality Requirements" and individual specification sections.
- J. Product Test Reports: Provide written reports indicating 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.
- K. Research/Evaluation Reports: Provide 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:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- L. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."
- M. Preconstruction Test Reports: Provide 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.
- N. Compatibility Test Reports: Provide 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 primers and substrate preparation needed for adhesion.
- O. Field Test Reports: Provide reports written by a qualified testing agency, on testing agency's standard form, 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.

- P. Maintenance Data: Provide written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Closeout Procedures."
- Q. Erection Drawings: Provide complete drawings indicating how components of the structure will be erected.
- R. Design Data: Provide written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Provide written or published information that documents manufacturer's recommendations, guidelines, and procedures for storing, installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Provide written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Provide written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Contractor's Key Personnel: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

2.3 DELEGATED DESIGN

- 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/Engineer.

- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, licensed in the State of Maryland, 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.

PART 3 - EXECUTION

3.1 CONSTRUCTION MANAGER'S REVIEW

- A. 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/Engineer. All submittals must bear the following certification, signed and dated by the Construction Manager, and by any Contractor, subcontractor, sub-subcontractor or supplier who has prepared the submittal for the Construction Manager:
- B. "I certify that the requirements of the Contract Documents have been met and all dimensions, conditions and quantities are verified as shown on the attached Submittal."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Construction Manager's approval, and statement complying with General Conditions of Contract certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- D. Work that requires submittals shall not commence until complete compliance with submittal requirements have been met. Submittals are not considered approved until Construction Manager receives acceptable Architect/Engineer's written disposition on the submittal. Submittals noted to be resubmitted shall be resubmitted until all items requiring modification or clarification have been met and no resubmission is required as indicated on the Architect/Engineer's disposition on the submittal.

3.2 ARCHITECT/ENGINEER'S ACTION

- A. General: The Construction Manager's responsibility for submitting true, accurate and complete submittals is not relieved by Architect/Engineer's review of and response to submittals. Architect's/Engineer's action on shop drawings cannot change the Work in the Contract Documents.
- B. General: Architect/Engineer will not review submittals that do not bear the Construction Manager's approval stamp and will return them without action.
- C. Color Selection: Architect/Engineer will select colors within 14 days (to allow time for presentation to Owner and for Owner comments) after all color samples have been submitted for all of the items listed below. The submittal data shall be complete, including shop drawings, product data, and color samples, and all required submittals and materials shall comply with the specifications and be subsequently approved by the Architect/Engineer. Color samples shall be actual samples of the material and not photographs. If there is a variation in color or lightness and darkness of the material, then two or more samples shall be submitted to show the range of variation.
 - 1. Exterior Items, including, but not limited to the following:
 - a. Cast stone.
 - b. Manufactured Stone Masonry.
 - c. Face Brick.

- d. Mortar.
- e. Exposed joint sealants.
- f. Roofing and canopy materials.
- g. Exposed metal flashing and trim.
- h. Aluminum entrances, storefronts, and curtainwall.
- i. Glass.
- j. Paint.
- k. Signage.

2. Interior Items, including, but not limited to the following:

- a. Exposed joint sealants.
- b. Wood door finishes.
- c. Aluminum storefront and entrances.
- d. Ceramic tile.
- e. Acoustical panel ceilings.
- f. Resilient floor tile.
- g. Resilient wall base.
- h. Paint.
- i. Toilet Compartments.
- j. Signage.
- k. Lockers.
- l. Casework.
- m. Window Blinds.
- n. Floor Grids.

D. Action Submittals:

1. Architect/Engineer will review each required submittal for the limited purpose of checking for general conformance with the design concept as expressed in the Contract Documents.
2. Architect/Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it.
3. Architect/Engineer's action on a specific item shall not indicate approval of an assembly of which the item is a component.
4. Architect/Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - a. Submittals Marked "Approved": The Work covered by the submittal is "accepted as specified" and the Work may proceed provided it complies with requirements of the reviewed submittal and the Contract Documents.
 - b. Submittals Marked "Approved as Noted": The Work covered by the submittal is "accepted as noted" and the Work may proceed provided it complies with Architect/Engineer's notations or corrections on the submittal and requirements of the Contract Documents. Resubmittal is not required unless Contractor cannot comply with noted changes; in which case, the Contractor shall resubmit for approval.
 - c. Submittals Marked "Resubmit" or "Resubmit as Requested": Do not proceed with the Work covered by the submittal. Revise or prepare a new submittal according to the Architect/Engineer's notations and requirements of the Contract Documents and resubmit without delay. Unmarked items may be fabricated only if indicated.
 - d. Submittals Marked "Not Approved": Architect/Engineer will list reasons for rejection on the submittal or in the transmittal letter accompanying the submittal. Do not proceed with the Work covered by the submittal. Prepare new submittal according to the notations and requirements of the Contract Documents and resubmit without delay.
 - e. Submittals Marked "Not Reviewed": Submittal is not required by Contract Documents; Architect/Engineer will not review.
5. Structural Calculations: Submittal of calculations for permanent or temporary construction structural components will be reviewed by the Architect/Engineer only for compliance with stipulated design criteria. The Architect/Engineer's review and/or any comments do not constitute any liability for the actual design of the structure.

- E. Informational Submittals: Architect/Engineer will review each submittal and will not return it, or if it does not comply with requirements, will return it with comments. Architect/Engineer will forward each submittal to appropriate party.
- F. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

- END OF SECTION 01 33 00 -

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Maintain quality assurance/control over suppliers, manufacturers, products, services, site conditions and workmanship to produce Work of specified quality.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractors of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-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 Contractors' other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractors to provide quality-assurance and quality-control services required by Architect/Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. Related Sections include the following:
 - 1. Division 1 Sections involving construction schedule requirements for developing a schedule of required tests and inspections.
 - 2. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Other Specification Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. 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.
- B. 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. Services do not include contract administration activities performed by Architect/Engineer.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated,

qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by a WACEL, NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. 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, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- K. Reference Standards: Comply with requirements of referenced standards specified in the Contract Documents except more rigid requirements are specified or are required by applicable codes and regulations. Unless a reference date is specified, conform to the reference standard current on the date the Owner issued the Bidding Documents. Specific standards referenced in building codes and regulations supersede this requirement. Reference Standards cannot change contractual relationship of parties to the Contract. Keep a copy of specified reference standards on-site during progress of specific work.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect/Engineer for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect/Engineer for a decision before proceeding.
- C. Comply completely with manufacturer's instructions. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect/Engineer.

1.5 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractors by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect/Engineer.

1.6 SUBMITTALS

- A. Qualification Data: Submit qualification data for all testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number 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 inspecting.
 - 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 re-inspecting.

- D. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, 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.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements. Perform Work by persons qualified to produce workmanship of specified quality.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, 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.
- C. 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.
- D. 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.
- 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 systems, assemblies, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: A WACEL, NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - e. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect/Engineer, with copy to Construction Manager. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Erect mock-ups for review at the site in accordance with requirements of the individual Specification Sections. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups at a location and of size indicated or, if not indicated, as directed by Architect/Engineer.
 - 2. Notify Architect/Engineer seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect/Engineer's approval of mockups before starting work, fabrication, or construction. Revise as needed to obtain Architect/Engineer's approval
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 5. Maintain mockups during construction in an undisturbed condition as a minimum standard of quality for accepting the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are specifically indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Construction Manager and Contractors with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for re-testing and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractors.
 - 3. Independent inspections and testing services which are the Owner's responsibility, including field quality control requirements, are indicated in the following Sections:

- a. Section 03 20 00 – Concrete Reinforcement
- b. Section 03 30 00 – Cast-In-Place Concrete
- c. Section 04 05 13 – Masonry Mortaring and Grouting
- d. Section 04 20 00 – Unit Masonry
- e. Section 05 12 00 – Structural Steel Framing
- f. Section 05 21 00 – Steel Joist Framing
- g. Section 05 31 14 – Steel Floor Centering
- h. Section 05 31 23 – Steel Roof Decking
- i. Section 05 40 00 – Cold Formed Metal Framing
- j. Section 07 20 00 – Thermal Protection
- k. Section 07 27 26 – Fluid-Applied Membrane Air Barriers
- l. Section 07 27 36 – Sprayed Foam Air Barrier
- m. Section 07 51 13 – Built-Up Asphalt Roofing
- n. Section 07 61 11 – Prefinished Metal Roofing and Trim
- o. Section 07 62 00 – Sheet Metal Flashing and Trim
- p. Section 07 70 00 – Roof and Wall Specialties and Accessories
- q. Section 07 84 13 – Penetration Firestopping
- r. Section 31 20 00 – Earth Moving
- s. Section 32 12 16 – Asphalt Paving
- t. Section 32 13 13 – Concrete Paving

B. Contractors' Responsibilities: Tests and inspections not explicitly assigned to Owner are the Contractors' responsibility. 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.

- 1. Where services are indicated as Contractors' responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractors shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
- 2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed. Do not install new work over work requiring inspection/testing until inspection/testing is completed.
- 3. Cooperate with inspection/testing agencies; provide access to the work
- 4. Provide the agencies with manufacturer's operations, test reports, design mixes, and submittal data and an adequate number of samples to be tested.
- 5. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
- 6. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractors' responsibility.
- 7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- 8. Pay for additional testing required when initial tests indicate that the work does not conform to Contract Documents.

C. Manufacturer's Field Services: Where indicated in respective Sections, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Within seven (7) days of inspection, provide representative's observations, findings and any directions in writing as specified in Division 1 Section "Submittal Procedures."

- D. Testing Agency Responsibilities: Provide services in compliance with Contract Documents, governing authorities and specified standards. Cooperate and coordinate with Owner, Architect/Engineer and Construction Manager in performance of duties. Provide qualified personnel to perform required tests and inspections as follows:
1. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 2. Conduct and interpret specified tests and inspections and shall clearly state in each report whether tested and inspected work complies with or deviates from Contract requirements.
 3. Notify Owner, Architect/Engineer and Construction Manager promptly, within twenty-four (24) hours, of irregularities or deficiencies observed in the Work during performance of its services.
 4. Promptly (within 3 days) submit a certified written (typed) report to Owner, Architect/Engineer and Construction Manager of each test, inspection, and similar quality-control service. Each report shall include the information required in each technical specification section and the following:
 - a. Date issued
 - b. Project title and number
 - c. Testing laboratory name, address, telephone and facsimile number
 - d. Name, employment and signature of the individual(s) making the test, or inspection
 - e. Date and time of test, sampling, or inspection
 - f. Identification of product being tested, or Specification Section requiring testing
 - g. Location of sample or test in the project
 - h. Ambient conditions at the time of sample-taking, or test
 - i. Type of inspection or test
 - j. Results and interpretation of tests
 - k. Comments or professional opinion as to whether tested or inspected Work complies with the requirements of the Contract Documents
 - l. Recommendations for re-testing, or re-inspection, as applicable.
 - m. Signature and seal of professional engineer responsible for oversight of test or inspection.
 5. Provide additional tests and inspections related to the Work, as requested by the Owner, for additional compensation.
 6. Attend progress meetings, as requested by Owner, to discuss testing and inspection issues.
 7. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 8. Do not perform any duties of Contractors.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Safe access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.

- F. 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 inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect/Engineer and Construction Manager promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect/Engineer with copy to Construction Manager and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, including a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected work.

1.10 SPECIAL INSPECTIONS SERVICES

- A. Testing and Inspection Service: Owner will engage an Independent Testing and Laboratory Agencies to monitor the Contractor's Quality Control Program and the Special Inspections Program. The Owner's monitoring activities in no way relieve the Contractor of responsibility for providing Quality Control or compliance with Contract Requirements.
- B. Contractors' Testing and Inspection Service: Contractor shall engage Independent Testing and Laboratory Agencies to provide inspection services not specified as Owner's responsibility.
 - 1. Contractors' Testing Agency shall make inspections, conduct and interpret tests, and state in each report whether Work complies with or deviates from requirements. Distribute reports within a maximum of 10 days of the inspection to Architect, Owner, Construction Manager, and the Building Authority.
 - 2. Each report shall include the permit number and building address and shall identify the individual performing the inspection or test.
 - 3. The report shall call special attention to any conditions that were not anticipated, or which are not in conformance with plans, specifications, applicable standards or the Building Code.
 - 4. Reports shall bear the signature of the registered engineer in charge of inspection or testing.
 - 5. Reports of corrective measures taken and adequacy of such measures shall bear the seal and signature of the Engineer in responsible charge of testing or inspection.
 - 6. Inspection personnel shall provide evidence of their competence to perform the inspections for which they are engaged, including as a minimum evidence of competence appropriate certification by Washington Area Council of Engineering Laboratories (WACEL), the National Institute for Certification in Engineering Technologies (NICET), or some other organization whose programs are recognized by Frederick County. When such applicable program is not available for evidence of competence, the individual involved shall furnish

- personal background information bearing upon his/her competence for County review and acceptance.
7. Engineering testing laboratory engaged to perform services relative to materials testing shall meet requirements of ASTM E329 and shall be accredited by Washington Area Council of Engineering Laboratories (WACEL), the American Association for Laboratory Accreditation (AALA), the National Voluntary Laboratory Accreditation Program (NVLAP) or some other organization whose laboratory accreditation program is recognized by Frederick County.
 8. At the completion of each area of work where indicated, provide certification as specified.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. 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/Engineer.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect/Engineer's reference during normal working hours.

3.2 DEFICIENT WORK

- A. General: If any materials or equipment selected for testing fails to meet the requirements of the Contract Documents, such materials or equipment shall be subject to removal and replacement by the Contractor. These non-conforming materials shall be removed from the site and replaced with materials or equipment meeting the requirements of the Contract Document. At the discretion of the Owner, the installed defective materials and equipment may be permitted to remain in place subject to a proper adjustment of the Contract Sum.
- B. If tests or inspections reveal failure of materials to comply with the requirements of the Contract Documents, the costs of additional tests by the Owner, and compensation for the Owner's and Architect/Engineer's additional services, made necessary by such failure, shall be charged to the Contractors by Change Order.

3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate evidence of inspection, testing and/or sample taking.
 1. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by, or for, quality-control service activities.

- C. Repair and protection are Contractors' responsibility, regardless of the assignment of responsibility for quality-control services.

- END OF SECTION 01 40 00 -

SECTION 01 42 00 REFERENCES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract

Documents:

ADAAG

Americans with Disabilities Act (ADA)
Accessibility Guidelines for Buildings and Facilities
Available from Access Board
www.access-board.gov

CFR

Code of Federal Regulations
Available from Government Printing Office
www.access.gpo.gov/nara/cfr

CRD

Handbook for Concrete and Cement
Available from Army Corps of Engineers Waterways Experiment Station
www.wes.army.mil

DOD

Department of Defense Military Specifications and Standards
Available from Department of Defense Single Stock Point
www.dodssp.daps.mil

FED-STD

Federal Standard (See FS)

FS

Federal Specification
Available from Department of Defense Single Stock Point
www.dodssp.daps.mil

Available from General Services Administration
www.apps.fss.gsa.gov/pub/fedspecs/index.cfm

Available from National Institute of Building Sciences
www.nibs.org

FTM

Federal Test Method Standard (See FS)

UFAS

Uniform Federal Accessibility Standards
Available from Access Board
www.access-board.gov

(800) 872-2253, (202) 272-5434

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The)	(202) 862-5100	www.aluminum.org
AAADM	American Association of Automatic Door Manufacturers	(216) 241-7333	www.aaadm.com
AABC	Associated Air Balance Council	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers Association	(847) 303-5664	www.aamanet.org
AASHTO	American Association of State Highway and Transportation Officials	(202) 624-5800	www.aashto.org
AATCC	American Association of Textile Chemists and Colorists (The)	(919) 549-8141	www.aatcc.org
ABMA	American Bearing Manufacturers Association	(202) 367-1155	www.abma-dc.org
ACI	American Concrete Institute/ACI International	(248) 848-3700	www.aci-int.org
ACPA	American Concrete Pipe Association	(972) 506-7216	www.concrete-pipe.org
AEIC	Association of Edison Illuminating Companies, Inc. (The)	(205) 257-2530	www.aeic.org
AFPA	American Forest & Paper Association (See AF&PA)		
AF&PA	American Forest & Paper Association	(800) 878-8878	www.afandpa.org (202) 463-2700
AGA	American Gas Association		(202) 824-7000 www.aga.org
AGC	Associated General Contractors of America (The)		(703) 548-3118 www.agc.org
AHA	American Hardboard Association		(847) 934-8800 www.hardboard.org
AHAM	Association of Home Appliance Manufacturers		(202) 872-5955 www.aham.org

AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCA	Architectural Spray Coaters Association www.ascassoc.com	(856) 848-6120
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400

ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(817) 326-6300
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312
CCFSS	Center for Cold-Formed Steel Structures www.umn.edu/~ccfss	(573) 341-4471
CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(514) 866-6121
CFFA	Chemical Fabrics & Film Association, Inc.	(216) 241-7333

	www.chemicalfabricsandfilm.com	
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CGSB	Canadian General Standards Board www.pwgsc.gc.ca/cgsb	(819) 956-0425
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(800) 463-6727 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.asce.org	(800) 548-2723 (703) 295-6300

EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association	(315) 339-6937
FCI	Fluid Controls Institute www.fluidcontrolsinstitute.org	(216) 241-7333
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmgglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridarooft.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fscoax.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com	(785) 271-0208
GBCI	Green Business Certification Institute www.gbci.org	800-795-1746
GRI	Geosynthetic Research Institute www.drexel.edu/gri	(215) 895-2343
GTA	Glass Tempering Division of Glass Association of North America (See GANA)	
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association	(703) 435-2900

	www.hpva.org	
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (See CSA)	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150
ITS	Intertek Testing Services www.itsglobal.com	(800) 345-3851 (607) 753-6711
IWS	Insect Screening Weavers Association (Now defunct)	
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association www.lma.org	(201) 664-2700
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
LSGA	Laminated Safety Glass Association (See GANA)	
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333

MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MH	Material Handling Industry of America (See MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NAAMM	North American Association of Mirror Manufacturers (See GANA)	
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NAMI	National Accreditation and Management Institute, Inc.	(304) 258-5100
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698

NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	NFPA International (National Fire Protection Association International) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo and Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (703) 779-1022
NTRMA	National Tile Roofing Manufacturers Association (See RTI)	
NWWDA	National Wood Window and Door Association (See WDMA)	
OPL	Omega Point Laboratories, Inc. www.opl.com	(800) 966-5253 (210) 635-8100

PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (703) 359-0826
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (508) 230-3516
PGI	PVC Geomembrane Institute www.pgi-tp.ce.uiuc.edu	(217) 333-3929
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	Contact by mail only
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
RTI	Roof Tile Institute (Formerly: NTRMA - National Tile Roofing Manufacturers Association) www.ntrma.org	(541) 689-0366
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabfurn.com	(516) 294-5424
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association	(703) 803-2980

www.smacna.org

SMPTE Society of Motion Picture and Television Engineers (914) 761-1100

www.smppte.org

SPFA Spray Polyurethane Foam Alliance (800) 523-6154
(Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
www.sprayfoam.org

SPIB Southern Pine Inspection Bureau (The) (850) 434-2611
www.spib.org

SPI/SPFD Society of the Plastics Industry, Inc. (The)
Spray Polyurethane Foam Division
(See SPFA)

SPRI SPRI (781) 647-7026
(Single Ply Roofing Institute)
www.spri.org

SSINA Specialty Steel Industry of North America (800) 982-0355
www.ssina.com (202) 342-8630

SSPC SSPC: The Society for Protective Coatings (877) 281-7772
www.sspc.org (412) 281-2331

STI Steel Tank Institute (847) 438-8265
www.steeltank.com

SWI Steel Window Institute (216) 241-7333
www.steelwindows.com

SWRI Sealant, Waterproofing, & Restoration Institute (816) 472-7974
www.swrionline.org

TCA Tile Council of America, Inc. (864) 646-8453
www.tileusa.com

TIA/EIA Telecommunications Industry Association/Electronic Industries Alliance (703) 907-7700
www.tiaonline.org

TMS The Masonry Society (303) 939-9700
www.masonrysociety.org

TPI Truss Plate Institute, Inc. (608) 833-5900
www.tpinst.org

TPI Turfgrass Producers International (800) 405-8873
www.turfgrasssod.org (847) 705-9898

UL Underwriters Laboratories Inc. (800) 704-4050
www.ul.com (847) 272-8800

UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902	
USGBC	United States Green Building Council www.usgbc.org	(800) 795-1747	
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463	
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 244-4700	(202)
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 639-0651	(503)
WCMA	Window Covering Manufacturers Association (See WCSC)		
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 661-4261	(212)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 299-5200	(847)
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930	

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

IAPM	International Association of Plumbing and Mechanical	(909) 595-8449	
ICBO	International Conference of Building Officials www.icbo.org	(800) 284-4406 (562) 699-0541	
ICBO ES	ICBO Evaluation Service, Inc. www.icbo.org/ICBO_ES/	(800) 423-6587	

ICC International Code Council, Inc. (703) 931-4533 (Formerly: CABO - Council of American Building Officials)

www.intlcode.org

- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the

entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-0990
DOC	Department of Commerce www.doc.gov	(202) 482-2000
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(202) 708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley Laboratory (See LBNL)	
LBNL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-5605
NCHR	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934

USDA Department of Agriculture
www.usda.gov

(202) 720-2791

USPS Postal Service
www.usps.com

(202) 268-2000

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

- END OF SECTION 01 42 00 -

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary of Work" for other work restrictions.
 - 2. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 1 Section "Execution Requirements" for progress and final cleaning requirements.
 - 4. Division 1 Section "Sustainable Design Requirements" for procedures for protecting indoor air quality.
 - 5. Divisions 2 through 33 Sections for environmental (heat, ventilation, and humidity) requirements for products in those Sections.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect/Engineer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities for project use without cost, including, but not limited to, Owner, Architect/Engineer, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, project identification sign, and parking areas for construction personnel.
- B. Project Identification Sign: Submit shop drawings for approval showing plan elevation, details and finishes for Project Identification Sign.
- C. LEED Submittal:
 - 1. EQ Credit 3: Construction Indoor Air Quality Management Plan
 - a. For filter media installed during construction and prior to occupancy: Documentation indicating MERV rating or filter class.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Temporary Use of Permanent Facilities
 - 1. Contractors must obtain prior written Owner approval before using any permanent facility, system or service not specified on the Contract Documents. The Owner's approval of Contractors' request for use of permanent facilities, system or services shall be totally at the Owner's discretion.
 - 2. Contractors shall be responsible for operation, maintenance, protection and restoration of each permanent facility, system or service during its use as a construction facility before Substantial Completion, regardless of Owner's approval of use. If used by Contractors, Contractors shall return permanent facility, system and services to "like new" condition prior to turnover to the Owner at Substantial Completion; this includes but is not limited to cleaning, replacement of filters, replacement of burnt out lamps and replacement of worn parts. Warranties for all permanent facilities, systems and services shall start at Substantial Completion regardless of any prior use by the Contractors.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link (Site Enclosure) Fencing: Minimum 2-inch , 9-gage, galvanized steel, chain-link fabric fencing; minimum 8 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 bases for supporting posts.
- B. Lumber and Plywood: Unless noted otherwise, comply with requirements in Division 6 Section "Rough Carpentry."
- C. Paint: Comply with requirements in Division 9 painting Sections.
- D. Filter media installed during construction and prior to occupancy: Minimum MERV 8 or F5 filter class.

2.2 TEMPORARY FACILITIES

- A. General: Maintain all temporary facilities and controls necessary for the performance of the Work. Comply with all applicable codes and regulations of authorities having jurisdiction;

obtain permits as required. Locate and install all facilities and controls where acceptable to the local authorities having jurisdiction, utility, and Owner and remove same and terminate, in a manner suitable to the utility owner, at completion of the Work or when otherwise directed. Pay all costs associated with the provision and maintenance of temporary facilities and controls including power, water, and fuel (if any) consumed until Substantial Completion.

- B. Field Offices, Construction Manager: Provide prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading; of sufficient size to accommodate needs of construction personnel. Provide at time of project mobilization. Keep office clean and orderly. Field office shall include the following:
 - a. Conference room or area of sufficient size to accommodate meetings of 10 individuals. Furnish room with conference table, chairs, and 4-foot- square tack board.
 - b. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - c. Lighting fixtures capable of maintaining average illumination of 20 foot-candles at desk height.
- C. Storage and Fabrication Sheds: Provide weather-tight sheds sized, furnished, and equipped to accommodate tools, materials and equipment for construction operations.
 - a. Store combustible materials apart from building.
 - b. Provide sheds sized to storage requirements for products of individual Sections, allowing for access and orderly maintenance and inspection of products.
- E. Storage and Staging Areas: The Construction Manager shall be responsible for coordination, protection and safekeeping of products stored on site under this Contract including soil cut and fill. Refer to Contract Documents for any defined staging areas.
 - a. Move stored products that interfere with construction of the Work, or operations of the Owner or separate contractors.
 - b. Obtain and pay for use of additional storage or staging areas as needed for the Work.
 - c. Provide storage areas sized to storage requirements for products of individual Sections, allowing for access and orderly maintenance and inspection of products.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide UL Listed or FM approved vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - a. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - b. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - c. If Owner authorizes use of permanent heating system, protect indoor air quality in accordance with Division 1 "Indoor Air Quality Management", including but not limited to the following measures:
 - i. Filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grill, as determined by ASHRAE 52.2-1999, and all HVAC systems, equipment and pathways shall be dust and particulate free at the time of substantial completion of that phase of construction, in accordance with SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."
 - 1. Replace filters during construction as necessary to protect equipment and indoor air quality.

- ii. HVAC supply and return ductwork, registers and equipment shall be kept clean, free of dust, debris, moisture, gaseous and microbial contamination during storage, handling installation and punch-out.
- iii. During the progress of construction, install new filtration media throughout the HVAC system. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 8 or better, dependant upon equipment and designed static pressure limitations, as determined by ASHRAE 52.2-1999.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate temporary 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.
- 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. Location of Construction Manager's field trailer shall be approved by Owner prior to installation.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Provide and pay for all temporary utility service and systems as needed for the efficient construction of the facility until Substantial Completion.
 - a. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 - b. Construction Manager is solely responsible for cost of, the coordination with the utilities for, and the timeliness of, the installation of temporary utilities until Substantial Completion. The Owner does not guarantee the availability of temporary utilities at the site, and does not guarantee the timing of permanent utility installation. The Construction Manager shall verify the availability of temporary permanent utilities prior to bid and shall arrange for, and pay for, all utility permits, inspections, connections, etc. necessary for provision of temporary utilities. No time extension will be granted based on the Construction Manager's failure to obtain temporary utilities in time to support completion of the project.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install temporary water service and distribution piping in sizes and pressures adequate for construction.
 - 1. Provide potable water approved by local health officials.
 - 2. Wash Facilities: Supply with potable water for personnel to wash-up for sanitary condition. Dispose of drainage properly. Provide cleaning compounds appropriate for each condition.
 - 3. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation as required to prevent freezing.
 - 4. Remove all temporary piping and connections after use is no longer required. Restore source of supply to its pre-construction condition.

- D. Sanitary Facilities: Provide temporary self-ventilated portable toilets for use by all construction personnel throughout the construction period. Keep toilet facilities clean, sanitary, provided with all appurtenances and in compliance with applicable codes and regulations. Service as often as necessary to prevent accumulation of wastes and creation of unsanitary conditions. Remove at Substantial Completion.
- B. 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. Within 30 calendar days of Notice-to-Proceed, Construction Manager shall submit in writing to the Architect/Engineer and Owner for review only, an electronic copy of its method and time schedule for heating during construction, which shall concur with his general progress schedule.
 2. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials, and before installation of finishes, Contractor shall pay for and provide heat therein of not less than 55 degrees F., or more than 75 degrees F., which shall be continuously maintained in the enclosed area until the project is accepted.
 3. Contractor shall provide one accurate recording Fahrenheit thermometer at a place designated by Owner's Construction Representative, and one additional accurate thermometer for every 2,000 square feet of floor space, located as directed by Owner's Construction Representative in order to determine if the specified temperatures are maintained. Contractor shall furnish daily to the Owner's Construction Representative three copies of a signed statement of temperatures recorded every three hours.
 4. Contractor, with the written approval of the Owner, may use the permanent heating system as specified for the project once it has been tested, flushed out and chemically treated, and is ready to operate. Contractor shall pay all energy costs for heating during construction and provide meters if required. Contractor shall coordinate the work so that the permanent heating system for the building will be available and ready to provide heat as soon as the building is closed in.
 5. Contractor shall arrange and pay for operation of the heating system including all costs to put in first-class condition all portions of the permanent heating system used for heating during construction prior to turnover and acceptance by Owner.
 6. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection. Heating devices, which may cause damage to finish surfaces, shall not be used.
 7. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated, and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
- C. Temporary Ventilation: Provide adequate ventilation in enclosed areas throughout construction period required to: facilitate progress of Work; to protect Work and products against excessive dampness and heat; to prevent moisture condensation on surfaces; to provide suitable environmental conditions for installation and curing of finish materials; to provide adequate ventilating to meet health regulations for safe working environment; and, to prevent hazardous accumulations of dusts, fumes, mists, vapors or gases in areas occupied during construction. Provide local exhaust ventilating to prevent harmful dispersal of hazardous substances into atmosphere of occupied areas. Dispose of exhaust materials in manner that will not result in harmful exposure to persons or property. Provide ventilating operations at all times personnel occupy an area subject to hazardous accumulations of harmful elements. Continue operation of ventilating system for as long as required after cessation of construction activities to assure removal of harmful elements.

- D. Electric Power Service: Provide electric power service and distribution system (meeting NEC requirements) of sufficient size, capacity, and power characteristics required for efficient construction operations.
 - 1. Equip service with meter, main disconnect, and over current protection.
 - 2. Provide branch distribution system from temporary power source with distribution boxes and outlets located so that power is available throughout active work areas.
 - 3. Permanent receptacles may be utilized during construction. Replace any receptacle plates and wiring devices damaged during construction.
 - 4. Remove all temporary wiring after it use is no longer required. Restore source of power to its pre-construction condition.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, safety and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements.
 - 2. Provide branch distribution system from temporary power source with distribution boxes and outlets located so that lighting is available throughout active work areas.
 - 3. Provide 1 watt per sq. ft. lighting to exterior staging and storage areas after dark for security purposes. Provide 0.25 watt per sq. ft. lighting to interior work areas after dark for security purposes. Provide a lighting level of 150 foot-candles per sq. ft. minimum on surfaces receiving finishes.
 - 4. Permanent lighting system may be utilized during construction with Owner approval. Restore permanent lighting systems used during construction to original condition. Maintain lighting and provide routine repairs.
- F. Telecommunications Service: Provide and pay for all costs (including installation, maintenance and monthly service costs) for telecommunications systems for the performance of the Work and for the Owner's trailer.
 - 1. Provide temporary telephone service in the field offices for use by construction and Owner personnel. Install one telephone line for each field office.
 - 2. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 - b. Provide a telephone line at each first-aid station.
 - 3. Provide Construction Manager superintendent with a cellular telephone for use when away from field office.
 - 4. Provide dedicated high speed (DSL or T-1) lines in Construction Manager's field office for computer (e-mail and internet) use.
- G. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

3.3 SUPPORT FACILITIES AND CONTROLS

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion after approval by Owner. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions approved by Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction prior to any work affecting public roads, sidewalks or other public right-of-ways.
 - 1. Maintain traffic on all streets adjacent to or leading to the site. Where construction operations interfere with the free movement of traffic, provide approved traffic controls, flagmen or similar devices to efficiently control traffic movement. With prior approval,

- provide detours as necessary for unimpeded traffic flow. Comply with approved traffic management plans when provided.
2. Protect existing site improvements including curbs, pavement, sidewalks and utilities. Keep streets, drives, and walks adjacent to site and haul routes clean and free of dirt, debris, and litter caused by construction operations.
 3. Provide means of removing mud and debris from vehicle wheels before entering public streets. Clean mud and debris from public streets and sidewalks as required.
 4. Track-equipped vehicles are not allowed on paved areas.
 5. Maintain access for fire-fighting equipment and access to fire hydrants at all times.
 6. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Haul Routes:
1. Consult with authorities having jurisdiction to establish public thoroughfares allowed to be used for haul routes and site access.
 2. Confine construction traffic to approved haul routes at approved hours.
 3. As required, provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.
- D. Maintenance of Access: Construction Manager shall provide and maintain until Substantial Completion, means of safe access to, around and within the site, for vehicular and personnel traffic.
1. Provide and maintain means of access (including access roads, construction personnel parking area and walkways) constructed to sustain the weight and easy movement of construction personnel and equipment used in construction of the Work.
 2. Provide and maintain means of access constructed to sustain the weight and easy movement of any Emergency vehicle required by governing authority. Provide and maintain access to site fire hydrants, free of obstructions, at all times.
 3. Construction Manager shall, without additional compensation from Owner, furnish labor and materials necessary to repair and maintain the means of access in an acceptable condition to meet performance requirements.
 4. Remove all snow and ice in an expeditious manner to protect and prosecute the Work.
- E. Temporary Signs: Provide temporary signs where needed to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
1. Provide temporary, directional signs for construction personnel and visitors.
 2. Maintain and touchup signs so they are legible at all times.
- F. Project Identification Sign: Construction Manager shall furnish and install one project sign as indicated below and as approved by Architect within thirty days of commencement of construction:
1. See attached for sample layout for project identification sign.
 2. Sign shall be installed near the project entrance at a location of high visibility approved by Architect/Engineer and Owner.
 3. Sign shall be installed and maintained plumb and level.
 4. Sign shall be fabricated from one-inch thick medium density overlaid exterior plywood laminated with waterproof glue. All edges of sign shall be banded with 1 inch by ½-inch pine banding. All nails, nuts, bolts and other connecting hardware shall be galvanized.
 5. Sign shall be supported by two 4" by 4" structural wood post supports set in 12 inch diameter concrete footings to a depth of four feet and so that sign is raised a minimum of four feet above grade.
 6. Sign shall be purchased from Maryland Correctional Enterprises (MCE) Sign Plant.
MCE Sign Plant #111
C/O Patuxent Institution
Attn: Charles Behnke, Plant Manager

7555 Waterloo Road
Jessup, MD 20794
Phone: 410-799-5102, or 410-799-5103
Fax: 410-799-7911
cwbehnke@dpscs.state.md.us

- Submit shop drawing indicating sign construction and lettering.
7. Construction Manager shall repair any deterioration or damage to the sign during the construction.
 8. At completion of the project, Construction Manager is responsible to remove and dispose of the sign, supports and foundations and to restore area.
 9. No other free-standing signs will be allowed except those required by law. All other signage shall be trailed mounted; subject to Owner's approval.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction and the requirements of other Sections. Maintain the Project site, excavations, and construction free of water from rain or snow, spring or ground water, backing up of drains, and other water sources.
1. Dispose of water in a lawful manner that will not result in flooding Project site or adjoining properties nor endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations and to protect the Work.
 3. As necessary, provide and operate sufficient dewatering and pumping equipment to maintain the site and the Work free of standing water.
- H. Waste Disposal Facilities: Comply with requirements specified in Division 1 Section "Construction Waste Management and Disposal."
- I. Lifts and Hoists: Furnish and maintain hoists, staging, rigging, scaffolding, and runways required in the execution of the work. Erect, equip, and maintain such temporary work in accordance with statutes, laws, ordinances, rules, and regulations of the governing authorities and insurance companies having jurisdiction.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Design of Temporary Structures: The structural design of all items used in the construction of the building and not a permanent part thereof, including but not necessarily limited to hoisting towers, shoring for concrete and masonry work, the temporary bracing for structural steel, and the shoring of cut earth banks, is the sole responsibility of the Construction Manager.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Comply with permit requirements and authorities having jurisdiction. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that prevent air, water, and soil contamination or pollution or other undesirable effects.
- B. Tree and Plant Protection: Comply with contract requirements, permit requirements and authorities having jurisdiction. As a minimum:
1. Preserve and protect existing trees and plants designated to remain.
 2. Provide 6 foot high barriers around drip line, with access for maintenance.
 3. Consult with Architect/Engineer; remove agreed-on roots and branches which interfere with construction.
 4. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
 5. Replace trees and plants damaged by construction operations.

- C. Temporary Erosion and Sedimentation Control: Comply with permit requirements and authorities having jurisdiction. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
1. Inspect, repair, and maintain erosion-control and sedimentation-control measures during construction until pavement has been installed.
 2. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow, and from waste disposal areas. Prevent erosion and sedimentation.
 3. Minimize amount of bare soil exposed at one time.
 4. Provide temporary measures such as berms, dikes, silt fences, drains, and other soil and erosion control devices required by authorities having jurisdiction.
 5. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 6. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- D. Stormwater Control: Comply with permit requirements and authorities having jurisdiction. Provide methods to control surface water to prevent damage to site or adjoining properties. Maintain excavations free of water; provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater. Grade site to drain; protect site from ponding water. Where required, provide, operate, and maintain pumping and dewatering equipment. Provide water barriers required to protect site from soil erosion.
- E. Dust Control: Execute Work by methods that minimize raising dust from construction operations. Provide positive and effective means of dust control both within the building and on the surrounding site. Construction Manager shall apply water and/or use other methods acceptable to Owner to minimize dust in the air. Comply with requirements of governing agencies.
- F. Noise Control: Perform all work within the time limits and requirements imposed by the authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum within the limits.
- G. Pest Control: Engage a pest-control service to minimize attraction and harboring of rodents, roaches, insects 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 environmentally safe materials.
- H. Site Enclosure Fence: Before construction operations begin, provide and erect specified site enclosure fence in a manner that will prevent people and animals from entering construction site except by entrance gates.
1. Extent of Fence: As noted on construction drawings or, if not noted, as required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide one key to Owner's Construction Representative.
 3. Construction fence shall be of chain link or other Owner-approved construction, erected in a substantial manner, straight, plumb and true.
 4. Gates shall be built into fence at such approved locations as are necessary, be well cross-braced and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate.
 5. Maintain the fence and gates in good condition for the duration of the construction operations and then remove them completely from the site, unless otherwise directed by the Owner.
 6. Restore site to original condition after removing fence.

- I. Security: Provide adequate security and lighting devices to prevent unauthorized entrance, vandalism, theft, use, and similar violations of security to Work and existing facilities. Install substantial temporary enclosure around partially completed areas of construction including all exterior openings. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security; lock entrances at the end of each workday. Coordinate with Owner's security program to prevent security violations.
- J. Protection of Installed Work: Protect installed Work and provide special protection where specified in individual Specification Sections.
 - 1. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
 - 2. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
 - 3. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials compatible with material being protected.
 - 4. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is required, obtain recommendations for protection from waterproofing or roofing material manufacturer. During the construction period after the installation of the roofing system, Construction Manager shall be responsible for damages to the roof caused by work or materials of the other trades.
 - 5. Prohibit traffic at landscaped areas.
- K. Protective Barriers: Provide barriers to protect existing facilities, the Work and adjacent properties from damage from demolition and construction operations. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing facilities. Provide protective barriers to protect plant life designated to remain. Protect vehicles, stored material and structures from damage.
- L. Safety: Provide safety protection to all machinery, equipment, and temporary and permanent facility hazards to prevent unsafe conditions and to comply with the safety requirements of the authorities having jurisdiction, OSHA and MOSHA.
 - 1. Protect all hazards with adequately constructed guardrails, fences or barricades and provide warning signs, lanterns, warning lights, and the like, as necessary to prevent unsafe access. To this end, dispose, store, guard, and protect the premises and all Work, materials, equipment and both permanent and temporary construction so as to preclude the unauthorized use thereof and particularly to eliminate possible consequent injury to all persons.
 - 2. Institute and maintain a safety program for worker safety at the site.
 - 3. Do not load or permit any part of the Work to be loaded so as to endanger its safety.
 - 4. At completion of the Work, all temporary security, safety, construction aids and protections shall be removed.
- M. Existing Underground Utilities: Comply with all laws and regulations concerning the identification and locations of all underground utilities. Utilities data on Drawings are based upon information obtained by Architect/Engineer and have not been verified by Architect/Engineer. Architect/Engineer and Owner are not responsible or liable for accuracy of the data supplied. Data shall not be relied upon by Construction Manager in complying with Contract Documents or safety requirements. Report to the utility any break, leak, dent, gouge, groove, or any other damage to facilities whether or not caused by the Construction Manager. Construction Manager shall notify Owner, Architect/Engineer and nearby occupants of any emergency situations that may arise.
- N. Temporary Enclosures: Provide temporary weather-tight enclosures and temporary heating for protection of the Work in progress and completed, from exposure (freezing or frost damage), foul weather, other construction operations, and similar activities as required by Contract Documents. Provide temporary weathertight enclosure for building exterior as

needed to maintain acceptable working conditions and to maintain specified environmental controls for product installation.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
 2. Provide protection as necessary to ensure adequate working areas during the months that temperature drops below 40 degrees F. Protection shall be consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations.
 3. Provide all "weather protection" material and be responsible for all costs, including for required heating to maintain a minimum temperature of 40 degrees F (see specific Sections for stricter environmental controls for some materials), at the working surface.
 4. See elsewhere in this Section for temporary heating requirements.
- O. Fire Exits: Maintain, for the entire length of the Work, all required exits to conform with regulations of authorities having jurisdiction
- P. Temporary Fire Protection: Provide fire protection and prevention in accordance with all applicable Federal, State and local codes and regulations and authorities having jurisdiction. Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Develop and supervise an overall fire-prevention and fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct construction personnel in methods and procedures. Post warnings and information.
 2. Prohibit smoking in hazardous fire-exposure areas.
 3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 4. All flammable liquid and material shall be properly stored in UL listed containers, properly handled, and kept to an absolute minimum at the site.
 5. Provide temporary standpipes and hoses as necessary 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.
 6. Provide and maintain fire extinguishers, and other fire-fighting equipment, as required by locations and classes of fire exposures.

3.5 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 meet specification requirements, 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 unless authorized in writing by the Owner.
- D. Termination and Removal: Remove each temporary facility, utility, equipment, material or control when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than request for Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed or damaged because of interference with temporary facility. Repair damaged Work or existing facilities, clean exposed contaminated surfaces, and replace damaged construction that cannot be satisfactorily repaired or cleaned.

1. Materials and facilities that constitute temporary facilities are property of Construction Manager. Owner reserves the right to take possession of Project identification signs.
2. At Substantial Completion, clean and restore permanent facilities and equipment used during construction period to original condition. Comply with final cleaning requirements specified in separate Division 1 Section.

- END OF SECTION 01 50 00 -

INTERAGENCY COMMISSION ON SCHOOL CONSTRUCTION



LARRY HOGAN
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REVISED MEMORANDUM

TO: All Directors of Facility Planning
All Directors of Maintenance

FROM: Robert A. Gorrell, Executive Director

DATE: June 5, 2019; Revised June 14, 2019 *RAG*

RE: Revision for Construction Sign

Each State funded school construction project shall have a construction sign on the site and a plaque for installation in the school as identified in Appendix E of the IAC/PSCP Administrative Procedures Guide (APG).

On May 1, 2019, Speaker Adrienne A. Jones was sworn in as Speaker of the House, resulting in revisions to the construction sign for State funded school construction projects. This revised sign is available through Maryland Correctional Enterprises (MCE) and should be used for State funded school construction projects. Replacement labels are available as well and may be adhered to existing signs in lieu of replacement signs.

The construction sign should be erected for all State funded school construction projects including all systemic renovation projects, with the exception of Aging School Program (ASP) and Qualified Zone Academy Bond (QZAB) projects less than \$100,000 and State-owned and locally-owned relocatable classroom building projects. This policy is consistent with the requirements of the IAC [Administrative Procedures Guide \(APG\)](#).

Please ensure that the new layout is followed exactly as sent to you, including the same slogan, names, colors, justification, size of lettering, etc. It is strongly recommended that construction signs be purchased through MCE.

MCE can be reached at:

Maryland Correctional Enterprises (MCE) Sign Plant #111
C/O Patuxent Institution
Attention: Charles Behnke, Plant Manager
7555 Waterloo Road Jessup, MD 20794
410-799-5102 - FAX: 410-799-7911
charles.behnke@maryland.gov
www.mce.md.gov

Please reference the enclosed revised pages until the Administrative Procedures Guide is updated with the revised information and review this information with your project architects, contractors and consultants.

If you have any questions regarding this matter, please contact Melissa Wies at Melissa.wies@maryland.gov or (410) 767-4656.

RG:mw

Enclosure

96 in

72 in



Larry Hogan, Governor
Boyd Rutherford, Lt. Governor

Building Bright

Futures in Maryland

The State of Maryland and the (Name of County) **Board of Education are:**

(Name of Project)

at the

(Name of School)

Public School Construction Program

Architect: (Name of Architect)

Contractor: (Name of Contractor)

The Maryland General Assembly

Adrienne A. Jones, Speaker of the House
Thomas V. Mike Miller, Jr., President of the Senate

Board of Public Works

Larry Hogan, Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.
- B. See specifically Articles 9 and 12 of the General Conditions of Contract.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project products including product delivery, storage, protection, and handling; warranties; product options, comparable products and substitutions; and quality of workmanship. Refer to individual Specification Sections for products' technical requirements.
- B. The Contract is based on the products and standards specified in the Contract Documents without consideration of proposed substitutions or Comparable Products. Owner may reject proposed substitutions or Comparable Products at its discretion.
- C. Related Sections include the following:
 - 1. Division 1 Section "Alternates" for products selected under an alternate.
 - 2. Division 1 Section "References" for applicable industry standards for products specified.
 - 3. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 4. Divisions 2 through 33 Sections for specific requirements for products including warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased 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, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
- B. Comparable Product: Contractor proposed product that is demonstrated and approved through submittal process, 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. Comparable products are allowed when "or equal" is indicated in the individual product specification. The terms "Comparable Product" and "Or Equal Product" are considered interchangeable and of the same definition.
- C. Substitution: Contractor proposed change to a product required by the Contract Documents where the original product does not allow "or equal" products or the proposed changed product does not qualify as an "or equal" product.

- D. Basis-of-Design Product: A specific manufacturer's product named and accompanied by the words "basis-of-design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 PRODUCT SUBSTITUTION REQUESTS

- A. General: Any proposed substitution must maintain the quality standards established by the Contract Documents for the specified product without any detrimental effect to the Owner. Refer to Section 12.6 of the General Conditions of Contract for additional requirements. Prior to issuing substitution requests or changes, review for LEED compliance and notify the Architect of any impacts to meeting LEED requirements. Contractor is responsible for any and all consequences of its failure to conduct this review properly and to make required notifications.
- B. Justification for Request: Owner will not consider requests for substitution after Contract Award, except for extenuating circumstances as follows. Requests may be considered or rejected at discretion of Owner.
1. The product is no longer manufactured.
 2. The product is not available due to a strike, lockout or bankruptcy.
 3. The product is not available due to an Act of God.
 4. The specified product is identified as incompatible or inappropriate for the project.
 5. The specified item fails to comply with building code requirements.
 5. The manufacturer or fabricator declares a specified product to be unsuitable for the use intended and refuses to warrant its installation.
 6. The requested substitution will provide the Owner with a cost savings without affecting the desired effect of the specified product.
- C. Substitution Request Procedures: If the substitution request is justified per the preceding article, submit each substitution request per the following procedures:
1. Limit each request to one proposed substitution.
 2. Substitution Request Form: Use CSI Form 13.1A or approved equal. Complete all lines. If a line is not applicable, indicate "N/A.". Identify the product to be replaced and the product to be substituted. Include Specification Section number, title and paragraph and Drawing numbers and titles.
 3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information including a list of any changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate the proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the product specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of Architect/Engineers and Owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

- h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Accurate cost information, including a proposal of change, if any, to the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents 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.
 - m. Other information as necessary to assist evaluation.
- D. Architect/Engineer Review: Architect/Engineer will review Contractor's written request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect/Engineer will return request to Contractor, without recommendation to the Owner, to record noncompliance with these requirements:
- 1. Written explanation stating one of the above reasons for justification of the substitution.
 - 2. Requested substitution does not require unacceptable revisions to the Contract Documents.
 - 3. Requested substitution is consistent with the Contract Documents and will produce desired results.
 - 4. Substitution request is fully documented and properly submitted.
 - 5. Requested substitution will not unnecessarily adversely affect Contractor's Construction Schedule.
 - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7. Requested substitution has been coordinated, and is compatible, with other portions of the Work.
 - 8. Requested substitution provides specified warranty.
 - 9. 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.
- E. Architect/Engineer's Action: If necessary, Architect/Engineer will request additional information or documentation for evaluation within one week of receipt of a substitution request. Within seven days of receipt of all required information or documentation, the Architect/Engineer will provide the Owner (with a copy to Contractor) with a recommendation to approve or reject the proposed substitution request.
- F. Owner Action: Within seven days of receipt of the Architect/Engineer's recommendation, the Owner will issue a written decision accepting or rejecting the proposed substitution. The rejection of any proposed substitution by the Owner will be final and without further recourse by the Contractor. In making such determinations, the Owner may, but will not be required to, rely upon the recommendations of the Architect/Engineer. If the event of Owner rejection, the specified product shall be provided.
- G. Submission of a Shop Drawing, Sample or Product Data indicating a proposed variance from the Contract Documents is not a proper submission and does not constitute a Substitution Request. Approval of a Shop Drawing, Sample or Product Data indicating a proposed variance from the Contract Documents does not constitute approval of a Substitution.

1.5 COMPARABLE ("OR EQUAL") PRODUCT REQUESTS:

- A. General: Any proposed Comparable Product Request must maintain the quality standards established by the Contract Documents for the specified product without any detrimental effect to the Owner. Refer to Section 12.6 of the General Conditions of Contract for additional requirements.
- B. Comparable Product Request Procedures:
 - 1. Limit each request to one proposed Comparable Product.
 - 2. Submit each comparable product request for consideration if specifically permitted by the individual Specification Section.
 - 3. Identify the product to be replaced and the product to be substituted. Include Specification Section number, title and paragraph and Drawing numbers and titles.
- C. Architect/Engineer Review: Owner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect/Engineer will return requests to Contractor, without recommendation to the Owner, to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents; that it is consistent with the Contract Documents and will produce the desired results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 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 Architect/Engineers and owners, if requested.
 - 5. Samples, if requested
- D. Architect/Engineer's Action: If necessary, Architect/Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Within seven days of receipt of all required information or documentation, the Architect/Engineer will provide the Owner (with a copy to Contractor) with a recommendation to approve or reject the proposed comparable product request.
- E. Owner Action: Within seven days of receipt of the Architect/Engineer's recommendation, the Owner will issue a written decision accepting or rejecting the proposed comparable product. The rejection of any proposed comparable product by the Owner will be final and without further recourse by the Contractor. In making such determinations, the Owner may, but will not be required to, rely upon the recommendations of the Architect/Engineer. If the event of Owner rejection, the specified product shall be provided.
- F. Submission of a Shop Drawing, Sample or Product Data indicating a proposed comparable product is not a proper submission and does not constitute a Comparable Product Request. Approval of a Shop Drawing, Sample or Product Data indicating a proposed comparable product does not constitute approval of a Comparable Product.
- G. After approval of the substituted product, the Contractor will make a submittal in accordance with the requirements in Division 1 Section "Submittal Procedures".

1.6 OTHER THAN "BASIS-OF-DESIGN" PRODUCT SPECIFICATION SUBMITTAL:

- A. If the Contractor submits a product other than the product specified as the basis of design, and the submitted alternate manufacturer is named in the relevant specification Section, that submittal shall be processed in accordance with requirements in Division 1 Section "Submittal

Procedures." Contractor shall submit all required evidence to show alternate product's compliance with technical requirements and equivalency with the basis-of-design product. The Architect/Engineer may directly approve or disapprove this type of submittal; Owner review and action is not required. Any costs associated with revisions to the Work and/or Contract Documents required by the Contractors request for other than the basis of design product will be borne by the Contractor.

1.7 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect/Engineer and Owner to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. After a determination has been made, provide products from sources producing products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Whenever the Contract Documents require that a product complies with Federal Specifications, ASTM Designations, ANSI Specifications or other association standard, the Contractor shall present an affidavit from the manufacturer certifying that the product complies therewith. Where requested or specified, submit supporting test data to substantiate compliance.
- D. Nameplates and labels: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1.8 OWNER-FURNISHED PRODUCTS

- A. See Specification Section 01 11 00.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions and recommendations.
- 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 upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 5. Provide appropriate equipment and qualified personnel to move products on-site without damage.

6. Each product shall be marked with unique identifiers including the project name, specifications reference and any other information needed to identify the product's specific use on the Project.
- C. Storage:
1. Comply with product manufacturer's written instructions and recommendations for temperature, humidity, ventilation, and weather-protection requirements for storage.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Prevent product contact with materials that may cause corrosion, discoloration or staining.
 4. Store materials in a manner that will not endanger Project or temporary structures.
 5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 6. Provide off-site storage when site does not permit adequate on-site storage or protection.
 7. Store cementitious products and materials on elevated platforms.
 8. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 9. Protect stored products from damage and liquids from freezing.
 10. Store loose granular materials on a solid surface in a well drained area; prevent mixing with foreign matter.

1.10 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: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to *Divisions 2 through 33* Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION AND PROVISION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that 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. Products required to be supplied in quantity within a Specification Section shall be of the same manufacture, shall be interchangeable, and shall be the same with regard to function, texture, pattern and color. To the greatest extent possible, provide products from a single source.
 3. 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.
 4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 5. Materials specified on the Contract Documents by reference to title, symbol, or number of a Commercial or Industry Standard, Federal Specification, ASTM designation, ANSI designation, Manufacturer's data, or other similar reference standard are identified hereby as the minimum requirement for the quality of materials required hereunder. References are to the latest editions of same, except as indicated otherwise. If not in contradiction to the building code or regulations of other governmental agencies as may have jurisdiction, such reference documents shall be considered as an integral part of these specifications as if repeated word for word herein.
 6. In case of conflict between differing specifications for a product, the most stringent specification (or the most stringent combination of specifications) shall apply. Contact the Architect/Engineer regarding interpretation of specifications as required.
 7. Do not use products salvaged from existing premises, except as specifically specified on the Contract Documents.
 8. Where products are accompanied by the term "as selected," Architect/Engineer will make selection.
 9. Where products are accompanied by the term "match sample," sample to be matched is Architect/Engineer's.
 10. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 5. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "comparable products" to obtain approval for use of an unnamed product
 6. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 1 "Product Substitutions" Article for consideration of an unnamed product or system.
 7. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 1 "Other than Basis-of-Design Products" Article for consideration of an unnamed product by the other named manufacturers.
 8. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified. Provide an affidavit from the manufacturer certifying that the product complies with standards, codes, or

- regulations and submit supporting test data to substantiate compliance, if requested by Owner.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect/Engineer's sample. Architect/Engineer's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 1 "Product Substitutions" Article for proposal of product.
 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, and textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect/Engineer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect/Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Products shall be applied, installed, connected, erected, used, adjusted, cleaned and conditioned in accordance with the respective manufacturer's instructions and recommendations unless more stringent requirements are specified.
- B. Verify and coordinate clearances, dimensions and installation of adjoining construction, equipment, piping, ducts, conduits, or other mechanical or electrical items or apparatus.
- C. Prior to fabrication, field measure actual existing conditions as applicable to ensure proper fit.
- D. Inspect each item of material or equipment immediately prior to installation. Reject damaged and defective items.
- E. Recheck measurements and dimensions of Work, as an integral step of starting each installation. Whenever stock manufactured products are specified, verify actual space requirements for setting or placing into allotted space.
- F. Anchor each product securely in place with positive anchorage devices designed and sized to withstand expected loads. Anchors shall be accurately located and aligned with other Work.
- G. Allow for expansion of materials and building movement.

3.2 PROTECTION OF INSTALLED WORK

- A. Clean, protect, adjust and perform maintenance on installed Work as necessary to ensure freedom from damage and deterioration at time of Substantial Completion. Remove protective devices when no longer needed.
- B. Provide special protection where specified in individual Specification Sections.

- C. Provide temporary and removable materials for protection of installed products. Control activity in immediate work area to minimize damage.
- D. Protect finished Work from damage, defacements, stains, scratches, and wear.
- E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- F. Protect finished floors, stairs, and other surfaces from traffic dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Prohibit traffic from lawn and landscaped areas

3.3 QUALITY STANDARDS

- A. Workmanship specified or indicated on the Drawings by reference to title, symbol, or number of a Commercial or Industry Standard, ASTM designation, ANSI designation, Manufacturer's data, or other similar reference standard is identified hereby as the minimum requirement for the quality of workmanship required hereunder. References are to the current issues of same, except as indicated otherwise. If not in contradiction to the building code or regulations of other governmental agencies as may have jurisdiction, such referenced documents shall be considered as an integral part of these specifications as if repeated word for word herein.
- B. Architect/Engineer may require that copies of certain reference specifications be kept at the job site.
- C. Damaged products shall be not installed as part of the Work. At the Owner's sole discretion, the Owner may approve the use of repaired items in the Work. The Contractor shall bear all costs related to replacing or repairing and refurbishing damaged products.

3.4 WORKMANSHIP

- A. Note that the quality required for certain workmanship specified in respective Specification sections may be better than that established by the identified reference standards.
- B. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- C. Perform work by persons qualified to produce workmanship of specified quality.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

3.5 MANUFACTURERS' INSTRUCTIONS

- A. When work is specified to comply with manufacturers' instructions, submit copies as specified in 01 33 00, distribute copies to persons involved, and maintain one set in field office.
- B. Perform work in accordance with details of instructions and specified requirements.

- END OF SECTION 01 60 00 -

**SECTION 01 73 00
EXECUTION REQUIREMENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Progress cleaning.
 - 3. Starting and adjusting.
 - 4. Protection of installed construction.
 - 5. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Requirements for field survey and layout requirements.
 - 2. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 3. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Division 1 Sections "Construction Waste Management and Disposal" and "Sustainable Design Requirements" for LEED-related requirements.

1.3 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Utilities: 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, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Acceptance of Conditions: 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. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 4. Do not proceed with Work until unsatisfactory conditions have been corrected. Proceeding with Work indicates acceptance of surfaces and conditions; the cost of any corrective measures is the responsibility of the Contractor.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility 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. Require compliance with manufacturer's printed installation instructions, including each step in the sequence. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by Contract Documents. See Specification 01 60 00 for specific requirements.
- E. 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/Engineer accordance with the requirements specified in Specification Section 01 31 00.

3.3 INSTALLATION

- A. General: See Specification Section 01 60 00 for Product Installation requirements.
- B. General: 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 8 feet in spaces without a suspended ceiling.

- C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- E. 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.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful 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 work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect/Engineer.
 - 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. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 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.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted. Dispose of waste in accordance with Construction Waste Management and Disposal plan.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

- A. See other Specification Sections for additional information on start-up and testing of building components.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- 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: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. See Specification Section 01 60 00 for product protection requirements.
- B. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

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

- END OF SECTION 01 73 00 -

SECTION 01 73 29 CUTTING AND PATCHING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: For each specific type of requested cutting and patching, submit a written proposal to Architect/Engineer for approval at least 10 days before any cutting and patching will be performed. Proposal shall include the following information:
 - 1. Extent: Describe amount, location, and size of proposed cutting and patching, and indicate why this cutting cannot be avoided
 - 2. Procedures: Specifically describe how cutting and patching will be performed,
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used. Provide specific information on products as requested by Architect/Engineer.
 - 4. Trades: Indicate the firms or entities that will perform the cutting and patching.
 - 5. Dates: Indicate when cutting and patching will be performed.
 - 6. Structural Elements: Where cutting and patching involve modifying structural elements, submit details and engineering calculations, generated by an engineer registered in the State of Maryland, indicating structural integrity of proposed modification.
 - 7. Effect on weatherproof integrity of the Work.
 - 8. Utilities: List utilities that cutting and patching activities will affect. Indicate utilities that will need to be temporarily out of service and the planned length and time of the outage. Indicate utilities that will need to be relocated.
 - 9. Cost proposal when applicable.
 - 10. Architect/Engineer's Approval: Obtain Architect/Engineer's approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could reduce their load-carrying capacity or load-deflection ratio.
- B. 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 results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect/Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Fire-Rated Assemblies: At penetrations of fire-rated assemblies, completely seal penetration with firestop in accordance with Division 7 Section.
- F. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

- A. Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void or diminish required or existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed. Comply with provisions of Section 01 73 00.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations. Protect surroundings areas from any dust or other residue resulting from cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Cut in-place construction to provide for installation or removal of components of the Work, and subsequently patch as required to restore surfaces to their original condition. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time after approval, and complete without delay.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage retained elements or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill. Do not damage or cut any steel reinforcing unless specifically allowed by the approved cutting and patching proposal.
 4. Structure: Do not damage or cut any structural framing unless specifically allowed by the approved cutting and patching proposal.
 5. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 7. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 1. Inspection: Test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
 6. Utilities: Where utilities are to be removed, relocated, or abandoned, by-pass before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe, duct, or conduit to prevent entrance of moisture or matter after by-passing and cutting.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove debris, paint, mortar, oils, putty, and similar materials.
- E. Painting: Where patching occurs in previously painted surface, provide appropriate prime coat followed by first finish coat of paint. Provide final finish coat over entire area containing patch; for continuous surface extend to nearest vertical break or intersection, for an assembly refinish entire unit. Except where indicated otherwise, finish in sheen and color to match existing.

- END OF SECTION 01 73 29 -

SECTION 01 74 19
CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Reduce construction and demolition waste on project site and minimize waste sent to landfills and incineration through implementation of a Construction and Demolition Waste Management Plan as required by LEED® v4 Building Design and Construction (LEED BD+C: Schools) Rating System and as outlined within this section. Throughout this section, the term LEED is used in place of LEED BD+C: Schools.
- B. Related sections: The following sections contain requirements that relate to this section:
 - 1. Division 01 Section "Sustainable Design Requirements-LEED" for definitions and reference standards relating to waste management, referenced herein.
 - 2. Division 02 Sections referring to demolition.

1.2 REFERENCES

- A. LEED v4 for Building Design and Construction, with all current addenda.
 - 1. Materials and Resources (MR) Prerequisite 2: Construction and Demolition Waste Management Planning
 - 2. MR Credit 5: Construction and Demolition Waste Management

1.3 PRELIMINARY SUBMITTALS

- A. Prior to any waste removal and within 30 days of Contract award, submit for approval a detailed Waste Management Plan in accordance with LEED MR Prerequisite 2 and Credit 5 requirements and as outlined in this Section.
 - 1. MR Prerequisite 2: Identify at least five materials (both structural and nonstructural) to be targeted for diversion.
 - a. Provide an estimated percentage of the overall project waste that these materials represent, and diversion goals for each.
 - 2. MR Credit 5 Select one of the following additional waste management goals:
 - a. Option 1 - Divert at least 75 percent, of total construction and demolition waste, identifying at least four individual material waste streams, from landfill or incinerator, by weight or volume.
 - 1) Commingled waste is calculated as one material stream unless the sorting facility provides diversion rates for specific materials using weight or volume.
 - b. Option 2 - Reduction of total waste: Limit waste to 2.5 pounds of construction waste per square foot (12.2 kilograms of waste per square meter) of the building's floor area.
 - 3. Describe means and methods to achieve required goal.

a. MR Prerequisite 2 and Credit 5 Option 1:

- 1) Indicate whether materials will be separated on site or comingled.
- 2) Identify recycling contractors and haulers proposed for the project and locations accepting waste materials or entities providing related services.
- 3) Describe how the recycling facility will process the material.
- 4) Comingled sorting facilities: Provide end destination and intended use for diverted materials.
 - a) For multiple waste streams: Provide statement that project specific diversion rates will be provided, by weight or volume.
 - b) For one comingled waste stream: Provide average annual recycling rate for the facility provided by the regulating local or state government authority. Confirm alternative daily cover (ADC) is excluded from the average annual rate.
 - c) Visual inspection is not an acceptable method of inspection for purposes of documenting percentage of comingled waste diverted from landfill.

b. MR Credit 5 Option 2: Describe source reduction strategies.

1.4 INFORMATIONAL SUBMITTALS

A. With each Application for Payment, submit waste management progress reports, demonstrating MR Credit 5: Construction and Demolition Waste Management.

1. Project title, name of party completing report, and dates of period covered by the report.
2. Option 1: Amount (by weight or volume) of recycled and/or salvaged construction and demolition waste to date, include the identified four material streams.
 - a. Exclude excavated soil, land-clearing waste from calculations.
 - b. Include materials destined for alternative daily cover (ADC) as landfilled waste.
 - c. Include wood waste converted to fuel (biofuel) or waste-to-energy as diverted from landfill in calculations.
 - d. Exclude all other types of waste-to-energy from calculations.
 - e. Comingling sorting facilities: Provide summary of diversion rates, type of materials recycled and description of the end destination of the recycled materials.
3. Option 2: Calculate waste generated per square foot of building floor area.
 - a. Exclude materials reused on site.
 - b. Include all materials donated, sent to reuse facility or reused off-site.
 - c. Include all materials sent to recycling facilities, landfills and incinerators.

1.5 CLOSEOUT SUBMITTALS

A. LEED Online: At completion of construction and prior to contract closeout, complete the LEED Online Form to the LEED Online Project Database for MR Prerequisite 2 and Credit 5: Construction and Demolition Waste Management and upload the associated required documentation

1. MR Prerequisite: Construction and Demolition Waste Management Plan and summary of diversion report.

2. For Demolition Phase work performed under separate contract: Include information provided by Owner in MR waste calculations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION, GENERAL

A. Training and Coordination:

1. Furnish copies of approved Waste Management Plan to all on-site supervisors, each subcontractor, Owner, and Architect.
2. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.
3. Meetings: Include construction waste management on the agenda of all required regularly scheduled construction meetings.

B. Facilities: Provide designated facilities for co-mingling or separation and storage of materials for recycling, salvage, reuse, return, donation and waste disposal, per approved Waste Management Plan for use by all contractors and installers.

1. Provide adequate space, convenient to subcontractors, for pick-up and delivery.
2. Keep recycling and waste bin areas neat and clean to avoid contamination of materials.

C. Records: Maintain on-site logs for each load of materials removed from site:

1. Include type of material, load (by weight or volume), recycling/hauling service, and date accepted by service or non-profit receiver.
 - a. Comingling waste as a single stream: provide documentation of percentages of diverted waste from the sorting facility for the corresponding month.
 - b. Comingled waste as multiple streams: provide documentation of percentages of individual waste streams based on weight or volume.

D. Methods of waste disposal that are not acceptable for LEED compliance:

1. Burning or incinerating on or off project site, except as described in PART 1 of this section.
2. Burying on project site, other than fill.
3. Dumping or burying on other property, public or private, other than official landfill.
4. Illegal dumping or burying.

E. Reuse of Materials On-Site: Set aside, sort, protect separated products in preparation for reuse.

1. Concrete, masonry and asphalt crushed and reused on-site contribute to MR calculations for Construction and Demolition Waste Management as diverted waste for Option 1 and do not contribute to MR Credit 3: BPDO – Sourcing of Raw Materials as reused materials.
 - a. MR Credit 3: 100 percent recycled content and regional content.
 - b. MR Credit 5: 100 percent diverted from land fill.
 2. Reused materials do not contribute to MR Credit 5: Construction and Demolition Waste Management, Option 2.
- F. Salvage of Materials: Set aside, sort, and protect products to be salvaged for reuse off-site.
- G. Hazardous Waste Handling: Separate, store and dispose of hazardous wastes separately from other materials and in accordance with local regulations.

- END OF SECTION 01 74 19 -

**SECTION 01 77 00
CLOSEOUT PROCEDURES**

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion.
 - 2. Final Completion.
 - 3. Warranties.
 - 4. Record Documents.
 - 5. Operation and Maintenance data and manuals.
 - 6. Training of Owner's personnel.
 - 7. Spare Parts and Attic Stock Material
 - 8. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
 - 3. Divisions 2 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. General: Refer to General Conditions Article 14.2.
- B. Procedures: Before requesting Architect/Engineer and Owner inspection for determining Substantial Completion, perform the following items. List any of the items below that are incomplete in request.
 - 1. Perform a complete inspection of the Work. Prepare a list of items to be completed and/or corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases including Fire Marshal's report.
 - 4. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 7. Complete startup testing of systems.
 - 8. Submit test/adjust/balance records.

9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 10. Advise Owner of changeover in heat and other utilities.
 11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 12. Complete final cleaning requirements, including touchup painting.
 13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 14. Complete functional performance testing.
- C. List Of Incomplete Items (Punch List)
1. Submit copies of punch list simultaneously to the Owner and Architect/Engineer. 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 Contractors that are outside the limits of construction.
 2. Organize list of spaces in sequential order, starting with exterior areas first.
 3. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 4. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Page number.
- D. Architect/Engineer and Owner Inspection and Approval: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect/Engineer will either proceed with inspection or notify Construction Manager of unfulfilled requirements. Architect/Engineer will prepare and sign the Certificate of Substantial Completion after inspection or will notify Construction Manager of items, either on Construction Manager's list or additional items identified by Architect/Engineer, that must be completed or corrected before certificate will be issued. After Owner receipt of a Certificate of Substantial Completion signed by the Architect/Engineer and Construction Manager, the Owner will determine whether to accept based on its review, observations and knowledge. The Owner's signature approval of the Certificate of Substantial Completion executes the Certificate. In reviewing the Certificate, the Owner may, but is not obligated to, rely on the signature approval of the Architect/Engineer in determining Contract compliance.
1. Reinspection: 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.

1.4 FINAL COMPLETION

- A. General: Refer to General Conditions Article 14.3.
- B. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
 2. Submit certified copy of Architect/Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect/Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- C. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect/Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued. In processing the Certificate, the Owner may, but is not obligated to, rely on the signature approval of the Architect/Engineer in determining Contract compliance.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 WARRANTIES

- A. The entire scope of work shall receive at a minimum a two-year warranty covering all materials and installations. Warranty shall commence upon Substantial Completion of the entire project scope of work.
- B. Provide all properly executed warranties prior to, or with, request for Substantial Completion.
- C. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated partial portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- D. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.6 RECORD DOCUMENTS

- A. General:
 1. Maintain one copy of Contract Documents and each submittal during the construction period for Project Record Document purposes.
 2. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
 3. Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Provide files and racks for secure storage. Do not use Project Record Documents for construction purposes.
 4. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Owner's and Architect/Engineer's reference during working hours.

5. Submit final Record Documents to Architect/Engineer at time of Substantial Completion. Documents should be submitted in both hard copy and electronic format. Record documents include, but not limited to:
 - a. Record Drawings:
 - 1) Contract drawings – marked-up
 - 2) Shop drawings – marked-up
 - 3) Newly prepared drawings
 - b. Specifications – marked-up
 - c. Product Data submittals– marked up
 - d. Record Samples
 - e. Addenda and Change Orders
 - f. Field records for variable and concealed conditions
 - g. Record information on Work that is recorded only schematically
- B. Record Drawings: Maintain at site one updated and current set of annotated project Record Drawings from project Notice-to-Proceed until Completion of the Work. Keep set available for use and inspection by Architect/Engineer and Owner. Submit completed set of Record Drawings to Architect/Engineer prior to Final Completion.
 1. Maintain one set of blue- or black-line white prints of all of the Contract Drawings and Shop Drawings. Mark Record Drawings 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 prepare the marked-up Record Drawings.
 - h. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - i. Accurately record information in an understandable drawing technique.
 - j. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 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 below first floor.
 - k. Locations and depths of underground utilities.
 - l. Revisions to routing of piping and conduits.
 - m. Revisions to electrical circuitry.
 - n. Actual equipment locations.
 - o. Duct size and routing.
 - p. Locations of concealed internal utilities.
 - q. Changes made by Contract Modification, Change Order or Field Order.
 - r. Revisions made following Architect/Engineer's Supplemental Instructions.
 - s. Details not on the original Contract Drawings.
 - t. Field records for variable and concealed conditions.
 - u. Record information on the Work that is shown only schematically.
 3. Mark completely and accurately the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note numbers of Field Orders, Alternates, Change Orders, and Supplemental Instructions, and similar revisions, where applicable.

7. Prepare new Drawings instead of preparing Record Drawings where Architect/Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 - a. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - b. Consult Architect/Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
 8. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize Record Drawings including newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Maintain at site one updated and current set of annotated project Record specifications, including addenda, field orders, and contract modifications, from project Notice-to-Proceed until Completion of the Work. Keep set available for use and inspection by Architect/Engineer and Owner. Submit completed set of Record Specifications to Architect/Engineer prior to Final Completion.
1. Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 3. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- D. Record Product Data: Submit one annotated copy of each Product Data submittal prior to Final Completion. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual, instead of submittal as Record Product Data, prior to Substantial Completion.
1. Maintain samples in clean dry condition; do not use for construction purposes.
 2. Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 3. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 4. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 5. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE DATA AND MANUALS

- A. Operation and Maintenance Documentation Directory
1. Organization: Include a section in the directory for each of the following:
 - a. List of documents.
 - b. List of systems.
 - c. List of equipment.

- d. Table of contents.
 2. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system. System is defined as: An organized collection of parts, equipment, or subsystems united by regular interaction. Subsystem is a portion of a system with characteristics similar to a system.
 3. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 4. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
 5. 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."
 6. Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Manuals, General
1. Provide three (3) sets of all manuals. Review each manual for accuracy and completeness before submitting. In addition to hard copies of manuals, submit an electronic copy as well.
 2. Organization: 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.
 - a. Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - b. 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. Use as many binders, up to 3" thick, as necessary to avoid overloading of binders.
 - 1) If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - 2) 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.
 - c. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab with non-erasable ink to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - d. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 - e. Each manual shall contain the following materials, in the order listed:
 - 1) Cover page.
 - 2) Table of contents.
 - 3) Manual contents.
 3. Cover Page: Enclose cover page in transparent plastic sleeve. Include the following information:
 - a. Subject matter included in manual.

- b. Name and address of Project.
 - c. Name and address of Owner.
 - d. Date of submittal.
 - e. Name, address, and telephone number of Contractor.
 - f. Name and address of Architect/Engineer.
 - g. Cross-reference to related systems in other operation and maintenance manuals.
4. 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.
- a. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
5. Manual Contents:
- a. System Description: Provide general overall of system or subsystem covered by the manual.
 - b. Submittal and Product Data: Include all final approved submittal data. If submittal was not required for review, include descriptive product data.
 - c. Equipment Supplier: Include the name, address and telephone number of the manufacturer's agent and/or service agency supplying or installing and starting up of the equipment.
 - d. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, 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.
 - 1) Prepare supplementary text on 8-1/2-by-11-inch white bond paper if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - e. 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.
 - 1) Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 2) Attach reinforced, punched binder tabs on drawings and bind with text. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - 3) If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - f. Final Pre-Functional Checklists: These checklists are to be completed by the Contractor, in accordance with the Commissioning Plan.
 - g. Parts List: edited to omit reference to items which do not apply to this installation.
 - h. Coordination: Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.
 - h. Schedule: Submit three copies, and the quantity of return copies required by the Contractor, by the completion date of equipment placement. All operations manuals must be approved (i.e. submitted, reviewed by

Architect/Engineer, corrected, and approved by the Architect/Engineer) prior to Substantial Completion. SUBSTANTIAL COMPLETION WILL NOT BE GRANTED WITHOUT APPROVED OPERATION AND MAINTENANCE MANUALS.

- 1) Include a complete operation and maintenance directory.
- 2) Correct or modify each manual to comply with Architect/Engineer's comments.
- 3) Submit 3 copies of each corrected manual within 15 days of receipt of Architect/Engineer's comments.

C. Operation Manuals

1. Assemble a complete set of operation information indicating proper operation of each system, subsystem, and piece of equipment not part of a system.
 - a. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - b. Prepare a separate manual for each system and subsystem, in the form of an instructional manual, for use by Owner's operating personnel
 - c. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - d. System, subsystem, and equipment descriptions.
 - e. Performance and design criteria if Contractor is delegated design responsibility.
 - f. Operating standards.
 - g. Operating procedures.
 - h. Operating logs.
 - i. Wiring diagrams.
 - i. Control diagrams.
 - j. Piped system diagrams.
 - k. Precautions against improper use.
 - l. License requirements including inspection and renewal dates.
2. Descriptions: Include the following:
 - a. Product name and model number.
 - b. Manufacturer's name.
 - c. Equipment identification with serial number of each component.
 - d. Equipment function.
 - e. Operating characteristics.
 - f. Limiting conditions.
 - g. Performance curves.
 - h. Engineering data and tests.
 - i. Complete nomenclature and number of replacement parts.
3. Operating Procedures: 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. Instructions on stopping.
 - f. Normal shutdown instructions.
 - g. Seasonal and weekend operating instructions.
 - h. Required sequences for electric or electronic systems.
 - i. Special operating instructions and procedures.
4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
5. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

D. Product Maintenance Manuals

1. Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
2. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
3. 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.
4. Product Information: Include the following, as applicable:
 - a. Product name and model number.
 - b. Manufacturer's name.
 - c. Color, pattern, and texture.
 - d. Material and chemical composition.
 - e. Reordering information for specially manufactured products.
5. Maintenance Procedures: Include manufacturer's written recommendations and 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. Schedule for routine cleaning and maintenance.
 - e. Repair instructions.
6. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
7. Warranties and Bonds: Include three copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - a. Include procedures to follow and required notifications for warranty claims.

E. Systems and Equipment Maintenance Manuals

1. Assemble a complete set of maintenance data indicating maintenance of each system, subsystem, and piece of equipment not part of a system.
 - a. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - b. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's maintenance personnel
2. 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 warranty and bond information, as described below.
3. 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.
4. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - a. Standard printed maintenance instructions and bulletins.
 - b. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - c. Identification and nomenclature of parts and components.
 - d. List of items recommended to be stocked as spare parts.

5. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - a. Test and inspection instructions.
 - b. Troubleshooting guide.
 - c. Precautions against improper maintenance.
 - d. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - e. Aligning, adjusting, and checking instructions.
 - f. Demonstration and training videotape, if available.
 6. 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.
 - a. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - b. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
 7. 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.
 8. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
 9. Warranties and Bonds: Include three copies of warranties, maintenance bonds, and Maintenance service contracts as specified in various Specification Sections. Provide lists of circumstances and conditions that would affect validity of warranties or bonds.
 - a. Include procedures to follow and required notifications for warranty claims.
- F. Emergency Manuals
1. Content: Organize manual into a separate section for each of the following:
 - a. Type of emergency.
 - b. Emergency instructions.
 - c. Emergency procedures.
 2. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - a. Fire.
 - b. Water leak.
 - c. Power failure.
 - d. Water outage.
 - e. System, subsystem, or equipment failure.
 3. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
 4. Emergency Procedures: Include the following, as applicable:
 - a. Instructions on stopping.
 - b. Shutdown instructions for each type of emergency.
 - c. Operating instructions for conditions outside normal operating limits.
 - d. Required sequences for electric or electronic systems.
 - e. Special operating instructions and procedures.

1.8 TRAINING OF OWNER'S PERSONNEL

- A. Program Structure: Develop and implement an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. Owner shall be given comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of equipment.
1. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect/Engineer.
 2. Coordinate scheduling of training with Commissioning Authority. Provide coordination with Contractor personnel, subcontractors, suppliers, and manufacturer's representatives for the efficient scheduling of instruction.
 3. Submit two copies of outline of instructional program for demonstration and training, including 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.
 4. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with Owner, through Architect/Engineer, with at least seven days' advance notice. Coordinate and adjust schedule to minimize disrupting Owner's operations.
 5. Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, their schedules and course content, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
 - 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.
 6. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
 7. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - a. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
 8. Set up instructional equipment, including the use of overhead projectors, sliders, videos, and audio taped material, at instruction location.
 9. All training sessions shall be recorded on video and copies of the videos provided to the Owner for future reference.
- 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:
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. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. 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.
9. Attendance and Evaluation: For each training module, submit list of participants and length of instruction time. At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test. For each participant and for each training module, submit results and documentation of performance-based test.
10. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before training.
11. At completion of training, submit one complete training manual(s) for Owner's use.
12. Schedule: All Owner training shall be completed prior to Substantial Completion. SUBSTANTIAL COMPLETION WILL NOT BE GRANTED WITHOUT COMPLETION OF OWNER TRAINING.

1.9 SPARE PARTS AND ATTIC STOCK MATERIAL

- A. Within 30 days of Notice-to-Proceed, submit a schedule of attic stock listing the required attic stock for the project. Organize the listing by specification section number and indicate the specific product type and attic stock quantity required by the specifications. As submittals are approved and products ordered, complete listing with actual quantity of each material installed and quantity of attic stock due.
- B. Provide spare parts and extra (attic) stock materials in quantities specified in individual Specification Sections.
- C. Deliver to Project site and place in locations as directed; obtain receipt from Owner's representative. Coordinate scheduling of Attic Stock deliveries with the Owner. Certain items that are required on a fixed maintenance schedule, such as HVAC filters, may have delivery deferred until a later date within the two-year warranty period.
- D. Submit document, at or before time of request for inspection for Substantial Completion, listing items and quantities; attach receipts.

1.10 FINAL CLEANING

- A. General: Provide final cleaning just prior to Substantial Completion. 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 portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscaped areas, free of rubbish, waste material, litter, obstructions and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, dust, films, and similar foreign substances.
 - g. Clean resilient flooring, stone flooring, tile, pavers and other similar hard interior surfaces including associated bases. Refer to individual manufacturer's recommendations and requirements for sealing, buffing, waxing and polishing.
 - h. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - i. Sweep concrete floors broom clean in unoccupied spaces.
 - j. Vacuum carpet and similar soft surfaces, removing debris, soil and excess nap. Shampoo to remove any visible soil or stains remaining after vacuuming.
 - k. Clean transparent and reflective materials, including mirrors and glass in doors and windows, to clear shine. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped, scratched or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not required as permanent labels.
 - m. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - n. Clean exposed surfaces of mechanical, electrical, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - o. Replace parts subject to unusual operating conditions.
 - p. Clean plumbing fixtures, drinking fountains, and similar equipment, to a sanitary condition, free of stains, including stains resulting from water exposure.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.

- D. Avoid disturbing natural weathering of exterior surfaces.
- E. Heating, Ventilating, and Air Conditioning Systems:
 - 1. Clean permanent filters and replace disposable filters for units operated during construction. Clean exposed surfaces of diffusers, registers, and grills.
 - 2. Clean ducts, blowers, and coils for units operated without filters during construction.
- F. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Submit a report prepared by the exterminator indicating successful completion of this work.
- G. Comply with safety standards and manufacturer's instructions for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

- END OF SECTION 01 77 00 -



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**SECTION 02 41 19
SELECTIVE DEMOLITION**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Demolition of designated structures, site elements and removal of materials from site.
- B. Demolition and removal of foundations and slabs-on-grade.
- C. Removal of portions of the existing paving, power, lighting, mechanical, plumbing, and equipment, walls, etc.
- D. All items demolished shall be removed from the site unless directed otherwise by the owner.
- E. Identification of utilities.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See reports regarding lead paint and asbestos, attached to the rear of this Section. Contractor shall perform all demolition and removal of materials included in the reports as described in the reports, and/or as required by all codes and standards of practice relating to these materials. Contractor is responsible for proper disposal off site, and providing evidence of that proper disposal to the Owner for record.
- C. Section 01 74 19 - Construction Waste Management and Disposal.
- D. Section 01 81 13 - Sustainable Design Requirements – LEED v4 for Schools.
- E. Section 31 20 00 – Earth Moving.

1.3 DEFINITIONS

- A. Remove & Dispose: Remove to and approved off site facility and legally dispose of any items noted as such in the contract documents, except those items indicated otherwise.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to

a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 SUBMITTALS FOR REVIEW

- A. Shop Drawings: Indicate demolition sequence and location and construction of temporary work. Provide complete temporary shoring and bracing package with Professional Engineers stamp. See Structural notes for additional information.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Schedule of selective demolition activities indicating the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
- E. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.
- F. Landfill records indicating receipt and acceptance of all wastes by a landfill facility licensed to accept such wastes.

1.5 SUBMITTALS FOR CLOSEOUT

- A. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition work, dust control and products requiring electrical disconnection.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct egress width to any building or site exit. Do not close or obstruct roadways.
- D. Notify affected utility companies before starting work and comply with their requirements.
- E. Conform to procedures applicable when hazardous or contaminated materials are discovered.
- F. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.

1.7 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 1 Section "Project Meetings."

1.8 PROJECT CONDITIONS

- A. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Storage or sale of removed items or materials on-site will not be permitted.
- D. Conduct demolition to minimize interference with adjacent and occupied building areas.
- E. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Fill Material: Specified in Section 31 20 00 – Earth Moving.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
- C. Arrange to shut off indicated utilities with utility companies.
- D. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 1. 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 after bypassing.
- E. Coordinate additional requirements under the provisions of Section 31 20 00 – Earth Moving.

3.3 PREPARATION

- A. Provide, erect, and maintain temporary barriers at locations as indicated on the drawings and as required to maintain occupancy of building during construction.
- B. Erect and maintain weatherproof closures for exterior openings.
- C. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise.
- D. Protect existing materials and which are not to be demolished.
- E. Prevent movement of structure; provide bracing and shoring.
- F. Notify affected utility companies before starting work and comply with their requirements.
- G. Mark location and termination of utilities.
- H. Provide appropriate temporary signage including signage for exit or building egress.
- I. Protect existing landscaping materials which are not to be demolished.
- J. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- K. Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- L. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

- M. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
 - 5. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
 - 6. Cover and protect equipment that has not been removed.
- N. Provide and maintain interior and exterior shoring, bracing, or structural support system to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished. Said structural support system must be prepared by professional engineer licensed in the State where work is to be performed.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent structures.
- B. Cease operations immediately if adjacent structures appear to be in danger. Notify Architect/Engineer. Do not resume operations until directed.
- C. Conduct operations with minimum interference to public or private accesses. Maintain egress and access at all times.
- D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- E. Sprinkle Work with water to minimize dust. Provide hoses and water for this purpose.
- F. Disconnect, remove, and identify designated utilities within demolition areas.
- G. Demolish in an orderly and careful manner. Protect existing supporting structural members and utilities to remain. Maintain weathertight and secure enclosure of existing building at all times.
- H. Remove existing foundation walls and footings within area of new construction.
- I. Remove concrete slabs on grade.
- J. Backfill areas excavated caused as a result of demolition, in accordance with Section 31 20 00 – Earth Moving.

- K. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option. Do not burn or bury materials on site. Leave site in clean condition.
- L. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition, and in original configuration unless directed otherwise by the owner.
- M. Remove temporary Work and restore existing building to its original condition unless directed otherwise by the owner.

3.5 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.6 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically. Complete selective demolition work at each area before disturbing supporting members on other areas.
 - 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. To minimize disturbance of adjacent surfaces, use hand 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 adequate ventilation when using cutting torches.

6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Dispose of demolished items and materials promptly.
 8. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- C. Break up and remove concrete slabs on grade, unless otherwise shown to remain.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

- END OF SECTION 02 41 19 -

**SECTION 03 11 00
CONCRETE FORMING**

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Conditions, any Supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this Section as fully as if repeated herein.
- 1.2 SECTION INCLUDES
- A. Job-Built Formwork, Prefabricated Forms, Form Ties and Accessories; Design; Construction and removal of forms, including shoring, bracing, cribbing, and screeds.
 - 1. Embedded Items: Provide accurate setting and placing of items built into the concrete to provide openings, recesses, attachment, or anchorage. Certain products are to be furnished as a part of this Contract and are specified in other sections.
 - 2. Formwork Design: Contractor shall hire a registered professional engineer who shall be responsible for the design of all temporary formwork including stripping procedures for concrete flat slabs, walls, columns, etc.
- 1.3 RELATED WORK
- A. Sections of DIVISION 3, CONCRETE, as well as all other sections involving interface with concrete work.
- 1.4 QUALITY ASSURANCE
- A. References: Comply with the following minimum standards:
 - 1. ACI-347R94 (ANSI A 145.1) Recommended Practice for Concrete Formwork.
 - 2. ACI-318-95 (ANSI A 89.1) Building Code Requirements for Reinforced Concrete
 - 3. ACI-301-96 (ANSI A 138.1) Specification for Structural Concrete for Buildings.
 - 4. ACI-117-90 Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 5. ASTM E-1155 Standard Method for Determining Floor Flatness & Levelness Using the F-Number System.
 - 6. ACI 302.1 R89 Guide for Concrete Floor and Slab Construction.
- 1.5 QUALITY CONTROL SUBMITTALS
- A. Certification: Form release materials will not discolor concrete and without removal from concrete are compatible with materials to be used for setting materials, adhesives, applied finishes, and coatings.
- 1.6 JOB CONDITIONS
- A. Design Loads: Do not place, handle or store products, equipment or other materials on structure, before concrete has reached its design strength and in such a manner as to not exceed design loads. Check with Structural Engineer for design loads of each area and review of construction loads. Any area damaged by construction operations must be repaired or replaced at no costs.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Lumber: Western Wood Products or Southern Forest Products grading. Common or Utility grades for non-exposed surfaces. Structural or Construction grades for walers, braces and supports.
 - B. Plywood: US Product Standard PA-1 "B-B (Concrete Form) Plywood" Class I, exterior grade or better, milled oiled and edge sealed, with each piece bearing legible inspection trademark.
- 2.2 ACCESSORIES: Furnish hairpin clips, bands, clamps, braces, adjustable shoring jacks, fasteners, form ties, etc., necessary to execute installation of formwork. No aluminum devices or fasteners (including nails) will be permitted.
- A. Form Ties: Non-corrosive, non-staining; minimum working strength as required by concrete sections being contained when full liquid concrete and construction loads; adjustable in length to permit complete tightening of forms and of such types as to leave no metal closer than 1-1/2" the surface, spacing as required to maintain formwork and finish concrete within tolerances and at a uniform spacing approved by the Architect, generally 24 inches on center.
 - B. Form Release: Non-staining liquid which will impart a waterproof film to prevent adhesion of concrete and will not stain, cause imperfections, or leave a paint-impeding coating on the face of the concrete. When finished surface is to be painted or to receive other surface treatment, the material applied to form surfaces shall be compatible with the type of paint or surface treatment to be used.

PART 3 - EXECUTION

- 3.1 DESIGN: Formwork and its supports shall carry adequately all liquid concrete, men, and equipment, in absolute safety under loads imposed during construction.
- A. Design and Placement of Forms: ACI 347, Chapter 2: Design and ACI 318, Chapter 6: Formwork, Embedded Pipes, and Construction Joints.
 - B. Tolerances: ACI-347 paragraphs 3.3 and 3.4, and ACI 117 will be considered absolute maximum, unless otherwise indicated.
- 3.2 CONSTRUCTION: Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage; securely brace and shore forms to prevent displacement and to safely support construction loads. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other features required in work.
- 3.3 BUILT-IN EMBEDDED ITEMS: Provide for installation of fastening devices required for attachment of other work. Properly locate in cooperation with other trades; secure and maintain in position before concrete is poured.
- A. Coordination: Ascertain requirements and extent, location and details of items to be embedded or built into concrete. Templates or setting diagrams shall be furnished by the various trades or manufacturers when items are to be set, embedded or blocked -out by this trade. Ensure that anchors reach adequate penetration and engage with reinforcement. Temporary support shall not be evident when forms are removed.
 - B. Work by Others: Allow sufficient time between erection of forms and placing of concrete for various trades to properly set embedded items required for their work. Maintain in position and protect all (provided and placed in the forms by the various trades) until concrete is completed.

1. Conduits: Cannot be run in the concrete.
- C. Anchorages: Items required to be set as a part of this work generally include: Inserts, sleeves, hangers, ties, anchors, bolts, base & leveling plates, frames, angle guards, dowels, anchor slots, reglets, nailing strips, blocking, grounds, sleepers, and adjustable wedge inserts. Refer to Miscellaneous Metals and Masonry Sections for certain products.
 1. Accurately locate utilizing a level or transit. Set in position with proper penetration, exposure and engagement with reinforcement. Maintain in position by double bolting to formwork or wood templates.
 2. Plates, Frames, Sleeves, Blocking and Miscellaneous Metals: Set item with perimeter flush with concrete surface. Ensure adequate bonding, anchorage and protection of dissimilar materials. Items shall have a thickness of not less than 1/8" (i.e. no cans, cups, etc.) Prevent leakage and infiltration of mortar into openings.
- 3.4 LINES AND LEVELS: Check the lines and levels of the completed formwork for all exposed columns, grade beams, walls, etc., before concrete is placed. Make whatever corrections or adjustments to the formwork to correct any deviations which exceed specified tolerances allowed.
- 3.5 CLEANING FORMWORK: Force debris to and out of clean-out panels with a jet stream of compressed air. Clean-out all debris. Hose form thoroughly with water and air-jet out any standing water when weather permits.
 - A. If concrete placing does not commence immediately after cleaning, cover openings in forms with tarpaulins.
- 3.6 FORM REMOVAL: Remove forms in accordance with ACI 301, Paragraphs 2.3.3 and 2.3.4; ACI 318 paragraph 6.2, and ACI 347 paragraphs 3.7 and 3.8. Removal strength of concrete for stripping shall be determined in accordance with ACI 301, paragraph 4.7.
 - A. Appearance: No steel spreaders, ties, or other metal, shall project from or be visible on any concrete surface.
 - B. Shoring: Leave shoring in place until concrete member will safely support its own weight, plus any loads that may be placed upon it. Any reshoring done must meet the requirements of ACI.

END OF SECTION 03 11 00

**SECTION 03 15 00
CONCRETE ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Construction joints, expansion joints and control joints.
- B. Vapor retarders under all interior concrete slabs on grade.

1.3 RELATED WORK

- A. Section 03 10 00 Concrete Forming.
- B. Section 03 30 00 Cast-In-Place Concrete.
- C. Section 07 92 00 Joint Sealants

1.4 REFERENCES

- A. ASTM - American Society for Testing and Materials
- B. ASTM A 924 – Specification for General Requirements for Steel Sheet Metallic Coated by the Hot Dip Process
- C. ASTM C 578 - Specification for Preformed, Cellular Polystyrene Thermal Insulation
- D. ASTM E 1745 - Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- E. ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

1.5 SUBMITTALS

- A. Manufacturers' Literature: Indicate compliance with product specifications.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit: BPDO – Material Ingredients
 - a. For joint sealants and vapor barrier, if available: Material Ingredient Report.
 - 2. EQ Credit: Low-Emitting Materials
 - a. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010, printed statement of VOC content in g/L, and volume of wet-applied material applied per product.
- C. Samples: Each type product with accessories, if requested.
- D. Shop Drawings: Indicate proposed locations of all construction joints and pouring sequence.

- E. Manufacturer's standard labor and material warranty for all joint sealant material which states that the product will be free of all defects (including workmanship) for a period of 5 years from the completion of the project. This includes all future labor and material deemed necessary to repair the sealant if any future cracks or leaks occur.

PART 2 - PRODUCTS

2.1 EXPANSION JOINT FILLERS

- A. Expanded Polystyrene: Closed-cell, extruded polystyrene with high density skin.

- 1. ASTM D-3575
- 2. Density = 2.0 pcf
- 3. Compressive Set (25%) = 20 psi.
- 4. Water Absorption = 1% maximum
- 5. Manufacturers:
 - a. "Deck-O-Foam" by W.R.Meadows
 - b. "Foamtastic" by Hohmann & Barnard

2.2 JOINT SEALANTS

- A. Refer to specification section 07 92 00, paragraph 3.7.A for joint sealants.

2.3 CONTROL JOINTS

- A. Metal Load Transferring type 24 gauge galvanized steel, (ASTM A-924), shaped to form a continuous tongue and groove load transferring key between concrete slabs, punched for doweling including stakes, splice plates and removable 1/8" plastic cap.

- 1. Manufacturers:
 - a. Jahn Div. of Superior – Screed Key
 - b. Heckman Building Products – Tongue and Groove Joint
 - c. Cardinal Mfg. Co. – Form-A-Key
 - d. Vulcan Metal Products, Inc. – Vulco Screed Joint
- 2. Locations: All interior concrete slabs on grade.

- B. Joint formed with 2 x 6 lumber and containing smooth steel dowels.

- 1. Locations: All interior concrete slabs on grade and concrete walls.

- C. Sawcut control joints made with a wet saw.

- 1. Locations: All interior concrete slabs on grade.

2.4 VAPOR RETARDER

- A. Provide vapor retarder cover over prepared base material where needed to prevent rapid escape of moisture into subbase and where indicated. Use only materials which are resistant to decay when tested in accordance with ANSI/ASTM E-154, as follows:

- 1. Polyethylene sheet not less than 10 mils thick.

PART 3 - EXECUTION

3.1 JOINT ARRANGEMENTS

- A. Location Criteria: Locate as to least impair the strength of the structure, and at locations coincident with designed structural and architectural features (specifically column lines). Maximum horizontal dimensions of a single unit of placement, 40 feet in a straight line (except footings).
 - 1. Locations: All locations are subject to approval.
- B. Joint Design: Follow a plane perpendicular to the principal reinforcement with a bulkhead shaped to produce a keyed surface except of expansion joints.
- C. Pouring Sequence: Continuous pouring between joints; however, do not place concrete in adjacent sections until 48 hours have elapsed from placement of original sections.

3.2 CONSTRUCTION JOINTS

- A. One edge of all construction joints shall have a 1/4" wide by 3/8" deep minimum breakout for the installation of the joint filler. Particular care shall be exercised to keep the surface of concrete in exactly the same plane on both sides of the joint.
- B. Framed Concrete Slab Surfaces: Roughen joint surfaces with a chipping hammer or by another approved method which will remove laitance, loose particles or aggregate, or damage concrete. After the surface of the joint has been cleaned of dust, chips, or other foreign material, an approved bonding agent (as specified in Section 03300) shall be placed on the joint surface prior to placing the next lift of concrete.
- C. Slab On Grade Construction Joints: Establish longitudinal and transverse control joints. With elevations checked by instrument stretch line over entire length. Drive stakes 2 ft. o.c. and attached screed to stakes. Provide lateral support where used as a bulkhead. Install smooth dowels and locate joints as specified in the contract documents.
 - 1. Locations: As indicated on the drawings, or if not shown, locate joints at 40'-0" o.c. maximum spacing for all concrete slabs on grade.
- D. Doweling and Keying: All formed construction joints shall be doweled. Provide keys, dowels or other details at construction joints as indicated.

3.3 EXPANSION JOINTS

- A. Exposed slabs on grade: Place joint filler 1/2 inch below the finished surface of the slab and extend to the bottom of the slab. The joint between the top of the filler and the finished slab shall be filled with a joint sealer.
 - 1. Locations: Where indicated. If not shown, divide exterior slabs into areas not exceeding 400 sq. ft. and exterior sidewalks into areas not exceeding 150 sq. ft.
 - 2. Type and Size: Use 1/2" thick expansion joint filler or other thickness indicated for full width and depth of concrete section..

3.4 CONTROL JOINTS

- A. Concrete Slabs: Install control joints in slabs on grade and sidewalks as indicated on the drawings, or if not shown, locate joints at 20'-0" o.c. maximum spacing for slabs on grade and at 5'-0" o.c. for exterior sidewalks.
- B. Type and Size: Concrete slabs shall have 1/8" wide sawcut joints installed 1/4 of the slab depth below the top surface within 8 hours of pouring slab.

3.5 INSTALLATION OF FILM TYPE VAPOR RETARDERS FOR CONCRETE SLABS

- A. Ensure subbase for concrete is compacted; sharp objects and scraps are removed.
- B. Place vapor barrier in widest practical widths with all joints lapped minimum 6 inches. Seal vapor barrier overlap together with Raven Vapor Bond Tape.
- C. Positioning: Maintain in place. Stretch and weight edges and laps to maintain their position until concrete is placed.
- D. Protection and Patching: Protect vapor barrier from rips. Hold patches in readiness during the concrete pouring operation and lay over all rips (beneath wire fabric and reinforcing steel.)
- E. Penetration: (Pipe, anchors, and other items) Seal vapor barrier material to the pipe and other penetrations with an elastomeric sealant that is approved by the vapor barrier manufacturer and architect.

3.6 JOINT SEALANTS

- A. The surfaces to receive the sealant shall be cleaned of any loose materials, dirt, dust, laitance, etc. Cleaning shall be done by power wire brushing followed by blasting with oil-free compressed air. No cleaning solvents shall be used.
- B. Install polyurethane sealant 1/8" below edges of the adjacent concrete per the manufacturer's recommendations. In areas where the joints have been overfilled, remove excess while still fluid or remove after hardening by grinding.
- C. Where the depth of the joint appears excessive, the depth of the polyurethane sealant may be limited to 0.5" by installing closed cell backer rod and non-bonding tape.
- D. Follow manufacturer's recommendations covering the proper method of curing the sealant. Prevent any contact with sealant before it has cured.
- E. Make test applications to insure that proper adhesion is being attained. If not, determine what additional steps are needed to provide it.
- F. Following the completion of the work, the Architect shall inspect the joints. Where the smoothness of the joint is determined to be unsatisfactory, the contractor shall grind down the surface of the joint to make it acceptable.

END OF SECTION 03 15 00

**SECTION 03 20 00
CONCRETE REINFORCEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SECTION INCLUDES

- A. Steel reinforcing bars, ties, dowels and welded wire fabric, miscellaneous reinforcement and accessories.

1.3 RELATED WORK

- A. Sections of DIVISION 3, CONCRETE, as well as all other sections including interface with concrete work.

1.4 QUALITY ASSURANCE

- A. References: Conform to and perform work in accordance with the current editions of:
 - 1. Local and State Building Codes.
 - 2. "Building Code Requirements for Reinforced Concrete", ACI 318-95.
 - 3. "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315, and CRSI 63 and CRSI 65.
 - 4. Specifications for Structural Concrete Buildings ACI 301.
 - 5. ANSI/AWS D1.4 Welding Code.

- B. Manufacturing Source: Reinforcing Steel of domestic origin.

- C. Fabricator: Maintain a competent engineering department and adequate equipment to fabricate steel in accordance with CRSI Manual of Standard Practice, latest edition.

1.5 SUBMITTALS

- A. Shop Drawings: Show plan layouts (including dimensioned slab openings), elevation drawings, bending, splicing, sizes, spacing and details of all reinforcing and accessories.
Please note that the Contract Documents in CADD format will not be made available to the contractor for their use in the preparation of the shop drawings, unless a release is signed.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel reinforcement: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For steel having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For steel having regionally sourced material: Documentation indicating location of extraction, manufacture, purchase of primary raw materials.

1.6 PRODUCT HANDLING

- A. Packing: Reinforcement must be tagged as required to indicate respective mill test and job condition.
- B. Storage and Handling: Protect products in such a manner as to prevent damage, bending, or undue rusting. Store at site to permit easy access for proper inspection and identification of each shipment. Separate material of each shipment for size and shape.

PART 2 - PRODUCTS

2.0 LEED CREDITS

- A. Recycled Content: Provide steel with minimum 90 percent total recycled content, including at least 60 percent post-consumer recycled content.

2.1 REINFORCING: Manufacture and deform in accordance with ANSI/ASTM A-615, except all reinforcing to be welded shall conform to ASTM A-706. All rebar shall consist of domestic manufacture billet steel of clean, new stock.

- A. All Bars: Use Grade 60 (yield) min. 60,000 psi.

2.2 WELDED WIRE FABRIC: Manufacture in accordance with ANSI/ASTM A185.

- A. Unless otherwise specified in the contract documents, provide 6"x 6"-W.2.9 / W2.9 W.W.F., Grade 65 (yield) min. 65,000 psi.

2.3 FASTENERS AND SPLICE

- A. Tie Wire: Double annealed steel wire, minimum #16 gauge, conforming to ANSI/ASTM A497.

2.4 ACCESSORIES: Provide all spacers, chairs, bolsters, ties and other devices necessary to properly place, space, support, and maintain reinforcement in locations. Provide in accordance with ACI-315. No aluminum inserts or accessories will be permitted.

- A. Bar Supports: Conform to "Bar Support Specifications", CRSI Manual of Standard Practice, Chapter 3, latest edition, and be of the following types:
 1. Support reinforcing in footings with precast concrete blocks.
 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
 3. Support reinforcement for slabs on grade with precast concrete blocks, or No. 5 rebar placed on metal chairs with plate bases as required to prevent penetration of earth or vapor barrier. Spacing of blocks, chairs, and No. 5 rebar shall be as necessary to prevent sagging of the reinforcement under the weight of construction workers and wet concrete.
 4. Support reinforcement for framed slabs (including slabs poured on metal deck) with No. 5 rebar placed on slab bolsters or chairs spaced as necessary to prevent sagging of the reinforcement under the weight of construction workers and wet concrete.

2.5 FABRICATION: Shop fabrication according to approved shop drawings. All fabrication of bars performed in a shop, with field fabrication done only where unavoidable, and approved.

- A. Reference: Fabricate in accordance with CRSI Manual of Standard Practice for Reinforced Concrete Construction.

PART 3 - EXECUTION

- 3.1 INTENT: All concrete shall be reinforced. For conditions not specifically shown or detailed, framing and reinforcement shall be provided in a manner consistent with other similar details or conditions shown on the drawings. Prior to work under these conditions, notify the Architect for confirmation.
- 3.2 PREPARATION
 - A. Clean bars of loose mill scale, rust, oil, and all coatings that will destroy or reduce the bond before placing, and again before concrete is placed.
 - B. Examine the drawings and specifications for all other Sections of Work, especially the mechanical and electrical work.
- 3.3 PLACEMENT OF REINFORCEMENT: Accurately place in positions and spacings shown. Securely support and fasten to prevent displacement before or during concrete placement. Place reinforcing steel, bar supports, and splice devices, in accordance with CRSI Manual of Standard Practice, latest edition; ACI 315 and ACI 318.
 - A. Support: Use approved accessories to hold reinforcement at proper distances from surrounding surfaces, with minimum coverage as indicated. Tying reinforcing steel with wire to nails in forms or using wood spacers is not permitted.
 - B. Spacing: In no case shall the clear distance between bars be less than 1 inch, nor less than 1-1/2 times the maximum size of coarse aggregate in the concrete, unless specifically indicated as bundled.
 - 1. Concrete Coverage and Protection: ACI-318.2.
 - 2. Clearance: The clear distance between bars also shall apply to the clear distance between contact splices and adjacent splices or bars.
 - C. Layering: Where reinforcement in beams or girders is placed in two or more layers, the clear distance between layers shall not be less than 1 inch, and the bars in the upper layers shall be placed directly above those in the bottom layer.
 - D. Field Adjustments: Move concrete reinforcing steel as necessary to avoid interference with other reinforcing steel, other embedded items; however prior to placing concrete, bars moved more than tolerances herein shall be inspected and approved.
 - 1. Sleeves and Embedded Items: Do not cut bars to clear sleeves or slots through slabs or walls. Wrap bars around these openings.
 - 2. Openings: Bar reinforcement terminated at openings in slabs and walls shall be compensated for by placing one half of reinforcement terminated on each side of openings for the full span length.
 - E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
 - F. Minimum Rebar and Dowel Extent: Provide minimum temperature reinforcing in all walls and slabs where no reinforcing is shown or noted.

- G. Minimum Placement: All reinforcing steel must be in place, wired, and inspected, before depositing concrete.
 - H. Protection: Protection care must be exercised in placing reinforcing steel to prevent any marring of interior faces of forms, shifting of forms, or damaging epoxy coating on reinforcing.
 - I. Provide protection for all vertical reinforcing bars that are not immediately enclosed by formwork.
- 3.4 FASTENING INTERSECTIONS: Wire tie reinforcement together at all points where bars cross. Splice as indicated. Welding or tack welding of reinforcement bars to other bars or to plates, angles, etc. is prohibited. Work shall be performed in accordance with CRSI Recommendations.
- 3.5 LAP SPLICES: Lap bars as scheduled on drawings and securely tie with wire at frequent intervals. Stagger so that adjacent splices will be apart with care taken to maintain proper clearance, between parallel bars and between bars and forms. Make lap splices in a manner to provide laps consistent with structural drawings, and CRSI.
- A. Tie Wires: Cut loose ends and turn wire twists inside of the section and bend so that placement of concrete will not force ends to exposed concrete surfaces.
- 3.6 DOWELS: Install with a template to hold bars in the proper position, placed as located on the drawings.
- A. Size: Dowels shall be of the diameter size indicated in various sections with lengths equivalent to twice that required for the indicated spliced. One-half of the length shall be embedded with the required splice length exposed for attachment.
- 3.7 INSPECTION
- A. Comply with inspection requirements of Sections 01 4000, Quality Control, 03 3000 Cast in Place Concrete, and Division 4 Masonry.
 - B. Inspect concrete and masonry reinforcement as indicated in ACI 301, Section 18, paragraph 18.4.1.2.
 - C. Inspect reinforcing size, quantity, strength, position (location), and arrangement. Concrete and masonry reinforcement includes welded wire fabric, and mild reinforcing bars. Inspection shall include but is not limited to the following.
 - 1. Insure rebar and welded wire fabric is not displaced during placement of concrete and masonry grout.
 - 2. Rebar size, quantity, strength, position (location) and arrangement in columns, beams, slabs, footings, walls, masonry, etc.
 - D. Submit daily reports indicating conformance and exceptions of concrete operation to contract documents.
 - E. See specification Section 03 3000 for further requirements.
- 3.9 CONTRACTOR'S RESPONSIBILITY
- A. Submit copies of all reports indicating conformance and exceptions to contract documents in a timely fashion to Construction Manager for distribution to design consultants, owner,

subcontractors and other interested parties.

- B. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 03 20 00

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Condition and Division 1 Specification Sections apply to this section.

1.2 SECTION INCLUDES

- A. Cast-in-place concrete including preparation, conveying, placement, leveling, finishing, hardening, sealing, curing, bonding, jointing, cutting, patching and grouting.
- B. Specific elements include foundations, walls, slabs, columns, stairs, etc.

1.3 RELATED WORK

- A. Sections of Division 3, Concrete, as well as all other sections involving interface with concrete work.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Representation: Arrange with the manufacturer to provide a representative to assist and instruct the trades in the proper application of his product. The manufacturer's representative shall be available to visit the site if it becomes necessary for this purpose, and certification of application.

1.5 REFERENCES

- A. American Concrete Institute (ACI): The following constitute part of this specification. Reference to Portland Cement shall mean type and color specified.
 - 1. 318 (ANSI A89.1) - Building Code Requirement for Reinforced Concrete.
 - 2. 306 (ANSI A144.1) - Recommended Practice for Cold Weather Concreting.
 - 3. 305 - Recommended Practice for Hot Weather Concreting.
 - 4. 211.1 (ANSI A167.1) - Recommended Practice for Selecting Proportions/Normal Weight Concrete.
 - 5. 304 (ANSI A186.1) - Recommended Practice for Measuring, Mixing and Placing Concrete
 - 6. 301 (ANSI A138.1) - Specification for Structural Concrete for Buildings.
 - 7. 311 (ANSI A188.2) - Recommended Practice for Concrete Inspection.
 - 8. 302.1 Guide for Concrete Floor and Slab Construction.
 - 9. 117 Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. American Society of Testing and Materials (ASTM):
 - 1. C-150 - Portland Cement
 - 2. C-309 - Liquid Membrane - Forming Compounds for Curing Concrete
 - 3. E-1155 Standard Method for Determining Floor Flatness & Levelness Using the F-Number System.

1.6 SUBMITTALS

- A. Mix Designs: All classes of concrete include aggregate gradation and actual proportioning.
- B. Manufacturer's Literature: Each material and accessory include manufacturer's directions and product specifications with recommended unit quantities.
- C. Joint Layouts: Indicate proposed joints required to construct the structure.
 - 1. Provide Layouts for exterior flag pole structure, exterior stage stair, and interior rooms with porcelain, ceramic and quarry tile flooring.
 - 2. Location of construction joints is subject to approval of the Architect.
- D. Samples: For colored concrete.
- E. Certification:
 - 1. Compliance: Notarized statement issued by manufacturers of the respective products that the supplied products meet requirements and are tested in accordance with standards specified.
 - 2. Compatibility: Certify that curing compounds, sealers and form release agents will not discolor concrete and without removal from concrete will not be harmful to later application of setting materials.
 - 3. Installation: Certify that the materials have been installed/applied in accordance with the manufacturer's instructions.
- F. Delivery Tickets: Duplicate tickets with each load; stating:
 - 1. Producer's Name; Delivery Date; Time Dispatched; Time Delivered; Truck Number; Number of Cubic Yards; Type and Brand of Cement; Amount of Admixture; Class of Concrete or Cement Content (Bags/Cubic Yards); Amount of Water Added at Job.
- G. Qualifications of inspection agency including past experience of field personnel to perform required inspection.
- H. Testing and Inspection Reports:
 - 1. Results of compression cylinders and grout cubes.
 - 2. Test Reports: Indicating strength and density of furnished product.
 - 3. Inspection reports: Certifying rebar, fibermesh and weld wire fabric placement, post-tensioned tendon placement and results of jacking operation, etc. (See Section 3.16 – Testing and Inspection).
- I. Concrete Hardner Warranty - Manufacturer's standard labor and material warranty for the concrete hardner compound which states that the product will be free of all defects (including workmanship) for a period of 5 years from the completion of the project. This includes all future labor and material deemed necessary to re-install the sealer if any areas of excessive wear due to normal occupancy occurs.
- J. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For cement, slag / fly ash: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For concrete mix having recycled content (slag and fly ash): Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

- b. For concrete having regionally sourced material (slag and fly ash): Documentation indicating location of extraction, manufacture, purchase of primary raw materials.
- 3. MR Credit: BPDO – Material Ingredients
 - a. For admixtures and coatings, if available: Material Ingredient Report
- 4. EQ Credit: Low-Emitting Materials
 - a. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010, printed statement of VOC content in g/L, and volume of wet-applied material applied per product.

1.7 PRODUCT HANDLING

- A. Storage: Store cements in dry, well ventilated enclosures.
- B. Do not use cement showing indication of moisture damage, caking and other deterioration.

1.8 ENVIRONMENTAL CONDITIONS

- A. Excess Moisture: Place no concrete during periods of rain, sleet or snow, unless adequate and approved protection is provided; allow no rain or other weather produced moisture to increase mixing water or to damage finished surfaces.
- B. Cold Weather Concrete: ACI-306.
 - 1. Admixtures: Do not use salt, chemicals or other foreign materials mixed with the concrete for the purpose of preventing freezing.
 - 2. Ground freezing: Cover concrete slabs on earth, footings and walls, as required to protect the ground underneath from freezing.
 - 3. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures by using insulating blankets or other approved method.
 - 4. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees Fahrenheit and not more than 80 degrees Fahrenheit at point of placement.
- C. Hot Weather Concrete: ACI-305. Prevent accelerated set from heat and winds. Maintain moist as required.
 - 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C-94 may be required.
 - 2. When air temperature is between 85 degrees Fahrenheit and 90 degrees Fahrenheit, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.
 - 3. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees Fahrenheit. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 - 4. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 - 5. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
- D. Thermal Change: Protect all concrete from rapid drying due to wind, overheating due to the

direct sun, freezing or thermal shock, to assure consistent curing for all concrete. Covering, reflective covering, shading, heating, insulating, cooling, wetting are measures which should be considered in maintaining minimal moisture loss at a relatively constant temperature during curing.

1.9 JOB CONDITIONS

- A. Design Loads: Do not place, handle or store products, equipment, or other materials on structure, before concrete has reached its design strength and in such a manner as to not exceed design loads. Check with Structural Engineer for design loads of each area and review of construction loading and proposed distribution of construction loads. Any area damaged by construction operation must be repaired or replaced at no cost to the Owner.
- B. Construction Damage: Do not permit walking or wheeling on fresh concrete until it has set for a sufficient length of time. Protect all concrete which will be permanently exposed in finished work from damage from construction operations specifically falling tools, mortar or other objects.
- C. On the framed floors, the steel beams and metal deck have been designed to deflect under the weight of the wet concrete. The Construction Manager shall provide additional concrete fill as necessary to produce a level floor.

PART 2 – PRODUCTS

2.0 LEED CREDITS

- A. Recycled Content of Backfill: Provide recycled concrete (RC-6) subbase and fill material, except under building slab.
- B. Recycled Content of Concrete Mix: Provide cement with minimum 25 percent recycled content, with Structural Engineer's approval.
- C. Regional Materials: Provide cement and aggregate manufactured and of primary raw materials extracted or recovered within 100 mile radius of Project Site.
- D. Interior wet-applied concrete curing compounds and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.1 CEMENT

- A. Portland Cement: ASTM C-150, Type I (unless otherwise approved by the Structural Engineer). Use one brand of cement throughout project unless otherwise acceptable to the Architect.
- B. Fly Ash: ASTM C-618, Type C or Type F.
 - 1. 15% - 20% fly ash may be used in concrete poured and cured above 50° Fahrenheit.
 - 2. No fly ash allowed in polished concrete.
- C. Blended Hydraulic Cement: ASTM C595, excluding types S and SA.
- D. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 120.
 - 1. 25% - 35% granulated slag may be used in concrete poured and cured above 50°

Fahrenheit

2.2 FINE AGGREGATE

- A. Sand: ASTM C-33. Clean, hard, natural sand, or manufactured sand, or a combination of both.
 - 1. Source: From the same source throughout the work for each type of concrete. Approval subject to color evaluation.

2.3 COARSE AGGREGATE

- A. Normal Weight Concrete: ASTM C-33, ACI-211.1, ACI-304-1. Aggregate shall have similar color characteristics of sand and cement.
 - 1. Maximum Size Aggregate: Maximum of 1-1/2" (3/4" for post-tensioned concrete or concrete poured on metal deck) but not more than 3/4 of clear distance between forms and the reinforcing bar and 3/4 of minimum clear spacing between reinforcing bars, and as recommended in ACI-211.
- B. Grout for Masonry: ASTM C404; maximum size of aggregate shall be 3/8" but not more than 3/4" of the clear distance between the inside block face and the reinforcing bar.

2.4 WATER

- A. Clean and free from deleterious amounts of acids, alkalis or organic materials.

2.5 ADMIXTURES

- A. Modifiers: To accelerate the hardening of the concrete or to produce higher than normal strength at early periods; will not be permitted unless specifically approved. Do not use any admixture which will affect the concrete color. Do not use admixtures without written approval and strict quality control.
- B. Water-Reducing Admixtures: ANSI/ASTM C-494, Type A, and contain not more than 0.05% chloride ions.
 - 1. Manufacturers:
 - a. Euclid Chemical Co. - "Eucon WR-75"
 - b. Master Builders Technologies - "Pozzoloth Normal" or "Polyheed"
 - c. Sika Chemical Corp. - "Plastocrete 161"
 - d. Chem-Masters Corp - "Chemtard"
 - 2. Products are subject to compliance to all project requirements.
- C. Accelerating Admixtures: ANSI/ASTM C-494, Type C, A non-corrosive, non-chloride set accelerating admixture that accelerates cement hydration resulting in shortened setting times and increased early age strengths, especially in cooler temperatures. Admixture shall not contain not more than 0.05% chloride ions.
 - 1. Manufacturers:
 - a. Master Builders Technologies - "Pozzoloth 555"
 - b. Grace Construction Products - "PolarSet"

2. Products are subject to compliance to all project requirements.
 3. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees Fahrenheit.
- D. Water-Reducing and Retarding Admixtures: ASTM C-494, Type D.
1. Manufacturers:
 - a. Sika Chemical Corp. - "Plastiment"
 - b. Master Builders Technologies - "Pozzolith R"
 - c. Gifford Hill - PSI 400N/PSI 400R
 2. Locations: Not permitted in footings or foundations. Retarding densifier shall be used as required by climatic conditions at the time of the pour as recommended by the manufacturer.
 3. Manufacturers Assistance: The admixture manufacturer shall be required to have available a qualified representative to assist in the proportioning and to advise on the use of the product for adjustment due to weather or job conditions.
- E. High Range Water-Reducing Admixture (Super Plasticizer): ASTM C-494, Type F or Type G and contain not more than 0.05% chloride ions.
1. Manufacturers:
 - a. W. R. Grace - "WRDA 19" or "Daracem"
 - b. Prokrete Industries, Inc. - "PSP"
 - c. Anti-Hydro - "Super P"
 - d. Sika Chemical Corp. - "Sikament 300"
 - e. ICI Americas Corp. - "Mighty 150"
 - f. Euclid Chemical Co. - "Eucon 37"
 - g. Gifford-Hill - "PSI Super"
 - h. Master Builders Technologies - "Rheobuild"
 2. Products are subject to compliance with all project requirements.
- F. Air Entraining Admixture: ASTM C-260; Air Content 6% +/- 1%.
1. Manufacturers:
 - a. W. R. Grace - "Darex AEA" or "Daravair"
 - b. Sika Chemical Corp. - "Sika-AER"
 - c. Sonneborn/Contech - "Aerolith"
 - d. Master Builders Technologies: - "MB-VR" or "Micro-Air"
 - e. Gifford Hill - "Air-tite"
 2. Locations: Use in all concrete which is exposed to the weather. Air Entraining Admixture shall not be used in slabs with a trowel finish, and shall not be used in all polished concrete.
- G. Calcium Chloride or admixture containing more than 0.05% chloride ions are not permitted.
- H. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Color 1: Match color of Manufactured Stone Masonry.
2. Color 2: Gray, as selected by Architect from manufacturer's full range.

2.7 BONDING AGENTS

- A. Presoak existing concrete surface to a saturated surface dry condition immediately prior to pouring of adjacent concrete slab sections.

2.8 NON-BONDING

- A. Non-bonding agents shall conform to ASTM C-309, Type I and AASHTO M-148, Type I.

1. Products: "Tilt-Eez" by Dayton Products.

- B. Non-bonding agents shall be applied in strict accordance with the manufacturer's recommendations.

2.9 CURING MATERIALS

- A. Curing Compound: Liquid-Type membrane-forming; ASTM C-309, Type I, Class A. Moisture loss not more than 0.055 GR./SQ.CM. when applied at 200 SQ. FT./GAL.

1. Manufacturer:

- a. "US Cure & Seal" by US Concrete Products
- b. "Conspec Cure & Seal WB" by Dayton Superior Corporation
- c. "EUCOCure VOX" by Euclid Chemical Co.
- d. "Kure-N-Seal-W" by BASF
- e. or approved equal

2. Note: Certified compatibility with approved surface sealing agents, mastics, adhesives, colored hardeners, finishes and deferred bonding, is required, before compound may be used where subsequent finishes are indicated.

3. VOC Content: Curing and sealing compounds shall have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. Location: All concrete, slabs, stairs and columns of the building prior to and immediately after removal of forms.

- B. All polished concrete shall be wet-cured per CPAA recommendations in accordance with ACI 308R-01.

2.10 SURFACE TREATMENTS

- A. Liquid Hardener: A clear penetrating, curing, sealing and hardening compound which results in increased abrasion resistance, and reduced permeability of the finished treated concrete surface.

1. Manufacturers:

- a. "Intraseal" - Conspec Marketing & Mfg. Co.
- b. "Lapidolith" - Sonneborn - Rexnord
- c. "Diamond Hard" - Euclid Chemical Co.
- d. "Ashford Formula" - Curecrete Chemical Company, Inc.
- e. Or approved equal.

2. Locations: All interior concrete floor slabs and stairs left exposed at the completion of the project.

2.11 ADJUSTABLE WEDGE INSERTS

- A. Type HW340 with 3/4" diameter, ASTM A-307 bolts as manufactured by Hohmann and Barnard, Inc., or approved equal.

2.12 NON-SHRINK GROUT

- A. CRD C-621 and ASTM C 1107, factory pre-mixed non-metallic grout subject to compliance with requirements. Provide one of the following:
 - 1. "Masterflow 713"; Master Builders
 - 2. "SonogROUT"; Sonneborn-Contech.
 - 3. "Euco-NS"; Euclid Chemical Co.
 - 4. "Five Star Grout"; U. S. Grout Co.
 - 5. "DuragROUT"; L & M Const. Chemical Co.
 - 6. "Supreme"; Gifford Hill

2.13 CONCRETE MIXES

- A. Compressive Strengths: Minimum concrete compressive strengths are as follows:
 - 1. 3000 psi; 28-day compressive strength; 517 lbs. cement per cu.yd. minimum W/C ratio, 0.56 maximum. (All concrete except as otherwise noted.)
 - 2. 3500 psi; 28 day compressive strength; 517 lbs. cement per cu. yd. minimum; W/C ratio, 0.45 maximum. (Concrete slab on grade.)
 - 3. 4000 psi; 28 day compressive strength; 564 lbs. cement per cu. yd. minimum; W/C ratio, 0.50 maximum. (All concrete poured on metal deck.)
 - 4. 4500 psi; 28 day compressive strength; 564 lbs. cement per cu. yd. minimum; W/C ratio, 0.45 maximum. (All exterior concrete and concrete to have a polished finish)
- B. Mix Design: Proportion by the procedure described in ACI 318. All concrete; ready-mixed; on site batch plant; mixed and transported in accordance with ASTM C-94, Alternate No. 1 or No. 2 and ACI 304.
 - 1. Responsibility: The Construction Manager is solely responsible for creating and paying for all concrete design mixes fully workable of required strengths that produce finishes acceptable to the Architect. All mixes shall be purchased from the same supplier throughout the work.
- C. Mixing: After introduction of water to the cement and aggregates, concrete which has been mixed longer than 1-1/2 hours or 300 revolutions, shall not be placed. In no case shall concrete be used that has been mixed so long that the initial set of the concrete shall occur sooner than 15 minutes after placement.
 - 1. Truck mixing: Trucks must be equipped with water gauges and revolution counters. Defer addition of water to latest possible revolution counters. Defer addition of water to latest possible time. When temperatures or other conditions cause a deviation in slump or setting characteristics, provide approved measures to maintain normal conditions.
- D. Slumps: ACI 301, paragraph 4.2.2.2. Proportion and design mixes to result in concrete slump at point of placement of not more than 8" after addition of HRWR.
- E. Dry Density:
 - 1. Structural Normal Weight Concrete: 148 lbs./c.f. maximum. (all concrete except as otherwise noted)

- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.14 MASONRY GROUT MIX

- A. Compressive Strengths: Minimum 28 day compressive strength shall be 3000 psi; standard weight; 5.5 bags (94 lbs.)/c.f. w/c = 0.60 maximum for all masonry grout.
- B. Mix Design: Proportion per the requirements of ASTM C476-83 - "Standard Specification for Grout for Masonry" ready mixed and transported in accordance with ASTM C-94, alternate No. 1 and ACI 304.
 - 1. Responsibility: The Construction Manager is solely responsible for creating and paying for all grout design mixes fully workable, of required strengths that produce finishes acceptable to the architect. All mixes shall be purchased from the same supplier throughout the work.
- C. Mixing: After introduction of water to the cement and aggregates, grout that has been mixed longer than 1.5 hours should not be placed. Because of its high slump, ready mix grout shall be continuously agitated after mixing until placement. In no case shall grout be used that has been mixed so long that the initial set of the concrete shall occur sooner than 15 minutes after placement.
 - 1. Truck Mixing: Trucks must be equipped with water gauges and revolution counters. Defer addition of water to latest possible revolution counters. Defer addition of water to latest possible time. When temperatures or other conditions cause a deviation in slump or setting characteristics, provide approved measures to maintain normal conditions.
- D. Slump: Water may be introduced at the plant to produce a maximum slump of 6". Additional water may be added at the jobsite immediately prior to placement to produce a maximum slump of 11".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordination: Check forms, reinforcing steel and supports, expansion and contraction joints, and placement of built-in and embedded items. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report all conditions which prevent proper execution of this work.
 - 1. Do not place concrete until foregoing related work has been completed and inspected.
- B. Built-in and Embedded Items: Allow sufficient time for the various trades between erecting of forms and placing of concrete, to permit the proper installation of their work. Do not place concrete until embedded items have been coordinated and installed.
 - 1. Coordination: Refer to Formwork, also examine the drawings and specifications for work of other trades, especially for Mechanical and Electrical Work.
 - 2. Conduits: Do not allow conduits or pipes to be placed in the concrete.
 - 3. Precautions: Embedding of aluminum inserts or conduit in the concrete will not be permitted.
 - 4. Anchorage and Supports: Refer to Concrete Accessories and Miscellaneous Metals

Sections for items to be embedded in the concrete. Refer to Formwork for installation.

- C. Surface to Receive Concrete: Clean, well thawed, damp surfaces, free from standing water. Before placing concrete, remove all debris, water and ice from the places to be occupied by the concrete. Wood forms shall be thoroughly wetted (except in freezing weather) or oiled and the reinforcement cleaned of ice or other coatings. Do not place concrete on soft mud or dry porous earth (see Spec Section 31 2000).
- D. Screed Levels: Set edge forms or bulkheads and wet intermediate screed strips for slabs to obtain the required elevations and contours in the finished slab surface. Provide and secure units sufficiently strong to support the types of screeds required.
 - 1. Alignment: Align the concrete surface to the elevation of the screed strips by the use of strike-off templates or accepted compacted type screeds.

3.2 CONVEYING AND PLACING

- A. Reference Standard: In accordance with requirements of Building Code Requirements for Reinforced Concrete, ACI 318, Chapter 5, Concrete Quality, Mixing and Placing, Section 5.9, Conveying, and Section 5.10, Depositing, and as modified herein.
- B. Wood Runways: Provide for wheeled equipment for transporting concrete. Do not displace the resteel or vapor barrier.
- C. Conveying: Rapidly handle from mixer to forms and deposit as nearly as possible in its final position to avoid segregation due to rehandling or flowing. Do not permit concrete during passage from mixer to final positioning to come in contact with aluminum surfaces.
- D. Placement: Place concrete of required thickness, compact, level and screed to proper levels to receive finishes specified. Do not deposit partially hardened or retempered concrete. Do not place concrete contaminated by foreign matter.
 - 1. Bearing Walls and Columns: Brace and allow to cure twelve hours before placing concrete superimposed thereon, in accordance with ACI 301, section 5.3.2.4.
 - 2. Slab Reinforcement: Welded wire fabric reinforcing shall be placed at the proper height by installing support steel as specified in specification 03 2000.
 - 3. Slabs: Do not pour faster than can be properly leveled and compacted. Place at point of final repose, directly ahead of the screed bar, vibrating mass just ahead of the screed.

3.3 CONSOLIDATION: ACI 301, Section 5.3.2.5

- A. Compacting: Thoroughly tamp and spade fresh concrete to insure flow into all parts of forms and around reinforcement. Use caution when using vibrators and hand spades to prevent any injury to working face of forms, or any movement of the reinforcement.
- B. Concrete shall be placed in such a manner as to insure that alignment of sleeves, embedded plates, and inserts remain unchanged. Special provisions shall be made to insure proper vibration of concrete around bearing plates and inserts.

3.4 LEVELING AND SCREEDING

- A. All top surfaces of poured concrete shall be worked smooth and level. Do not sprinkle dry cement or mixture of cement and sand directly on the surface of the concrete to absorb moisture or to stiffen mix. Surfaces shall be brought to a finish level, free from defects, blemishes, ripples, trowel marks and other irregularities, including footprints and other

depressions which may be cause for rejection.

- B. Screeds: Of such type and construction, and so spaced and located as to produce surface tolerances specified.
- C. Unformed Surfaces: Bring to proper levels and slopes, using screeds, and strike-off with a straightedge. Screed twice, the first to strike a full, rough level and move the concrete mass ahead. Follow this with necessary filling of low areas and another screeding to final level. Remove any puddles of "soup," excess water, or laitance. Pull screeds and screed supports and fill all depressions.
 - 1. Floating: Float to a true and uniform surface with no coarse aggregate visible.
- D. Levels and Lines: Establish and check levels and lines by instrument, and from time to time during pours. Finally check lines and levels, again by instrument, after straight edging and screeding. Correct any settlement and/or other irregularities greater than the allowable tolerances.
 - 1. Floor slabs on grade shall be finished to the following requirements:
 - a. The F-numbers which shall apply to the whole floor shall be a flatness $F_f = 30$ or higher, and a levelness $F_l = 25$ or higher.
 - b. The minimum local F-numbers which shall apply to the floor area bound by construction and/or control joints shall be a flatness $F_f = 22$ or higher, and a levelness $F_l = 19$ or higher.
 - 2. The minimum local F-numbers for elevated concrete slab floor areas bound by a structural bay shall be a flatness $F_f = 22$ or higher, and a levelness not to exceed 3/8 inch within any structural bay.
 - 3. Exterior concrete stairs shall have the treads and landings sloped approximately 1/8" per 12" to assure that no water rests on a riser or the landings.

3.5 UNFORMED CONCRETE SURFACE FINISHES

- A. Reference Standard: All concrete finishes shall be specified designating in ACI 301 Section 5.3.4.2, except as modified herein.
- B. Troweled Finish: After concrete is sufficiently hardened to prevent drawing moisture and fines to the surface, finish trowel until matrix no longer accumulates on the trowel. Do not use cement, sand, or a mixture thereof to absorb excess moisture and do not add water to facilitate troweling. Perform second troweling until there is a distinct ringing sound under the trowel, and smooth, hard furnished surface is obtained. Use liquid curing membrane except where indicated. (See Products)
- C. Interior floor slabs shall have a smooth trowel finish. At Construction Managers option, the slab can be finished by light broom at the location of hard tile.
- D. Exterior floor slabs shall have a broom or belt finish.

3.6 SURFACING CURING

- A. Application: Apply liquid-type combination curing compound as soon as new concrete is hard enough to support applicator's weight and as soon after final troweling as possible, in such a manner as to prevent marring or damaging troweled surface. Apply in strict accordance with the manufacturer's recommendations, and with the initial application done under the direct

supervision of the manufacturer's representative.

- B. During period of dry winds, low humidity, high temperatures, and other conditions causing rapid drying, protect fresh concrete with an evaporation retardant (mono-molecular film) or fine fog spray of water applied immediately after screeding and bull floating. Maintain protection until final finishing and curing compounds are applied.

3.7 SURFACE SEALING

- A. Liquid Hardener Application: Apply to concrete surfaces that are clean, set and dry; not less than 60 days old. Surface must be free of any dust, dirt, and other foreign matter. Apply hardener in strict accordance with manufacturer's recommendation for standard duty finished floor. Apply by spray or flush onto surface and distribute minimum of 2 applications in accordance with manufacturer's instructions.

3.8 FORMED CONCRETE SURFACES

- A. All formed concrete finishes shall be as specified in ACI 301, Section 5.3.3.4, except as modified herein.
- B. Cork Floated Finish where exposed to view, unless otherwise indicated.
- C. As Cast Formed Finish where not exposed to view, patch as required, unless otherwise indicated.

3.9 CONCRETE SURFACE REPAIRS

- A. Repair method, products and procedures shall be submitted for approval prior to commencement of work.
- B. Patching Defective Areas:
 - 1. Repair and patch defective areas with repair mortar such as Tamms Speedcrete – Redline immediately after removal of forms, when acceptable to Architect.
 - 2. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water to a saturated-surface-dry condition and install repair mortar in strict accordance with the manufacturer's specifications.
- C. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- E. Repair concealed formed surfaces, where possible that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

- F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
 - G. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.03" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
 - H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
 - I. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
 - J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete to a saturated-surface-dry condition. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
 - K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces to a saturated-surface-dry condition. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack when concrete surface is still saturated. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- 3.10 NONCONFORMING STRENGTH: If strength of laboratory control cylinders at 7 or 28 days for any portion of the work falls below required strengths, the Structural Engineer has the right to order a change in proportions for the remaining work, and/or may order additional reshoring and moist-curing of the sections in question. In addition, at his discretion, the Structural Engineer has the right to require tests in accordance with ASTM C-42 (cored cylinders) or order load tests on portions of buildings so affected. Perform all test changes as noted above and/or other required corrective measures as directed by the Structural Engineer at no expense to the Owner, regardless of test results. The structural Engineer is the sole interpreter of additional tests and his judgement is final.
- 3.11 RESPONSIBILITY
- A. The Owner shall employ and pay for services of an independent Testing Laboratory, and an Inspection Agency, acceptable to the Structural Engineer to perform the specified tests and inspection. (ACI 301, Section 1.6.1 and 1.6.2).
 - B. Approvals: The design mix and/or acceptance of the test reports do not in any way relieve the Contractor of his responsibility to insure that the strength, slump and quality of the in-place concrete meets the requirements of the Contract Documents.
 - C. Rejection: The Owner's representative will have the right to reject concrete which does not

meet strength and other requirements of the Contract Documents.

- D. Mixing Design: If the strength of any test cylinder or grout sample fails to meet the ultimate compressive strength, the Owner's representative shall have the right to require a change in proportions to ensure adequate strengths in the remainder of the project.
- E. Additional Testing: Owner's representative shall have the right to require testing of the concrete by coring, loading or other means, or removal of that portion of the construction covered by those tests, all costs of which to be borne by the Construction Manager.

3.12 ADDITIONAL CONTRACTOR'S DUTIES: Comply with ACI 301, Section 1.6.3 including but not limited to the following:

- A. Batch Plant Samples: If desired by Construction Manager, or so requested because of known or indicated problems.
- B. Storage: Provide suitable storage facilities at the job site for test cylinders.
- C. Additional Costs: Pay all costs for coring, drilling, additional testing, remedies and corrections of work which does not meet strength and other requirements of the Contract Documents and/or if failure to perform required duties. Comply with ACI 301, Section 1.6.5.
- D. Other Test Cylinders: For other than compressive strength, such as to determine when forms may be stripped, shall be paid for by the Construction Manager requesting same.

3.16 TESTING AND INSPECTION

- A. Field and laboratory testing of poured in place concrete and masonry grout shall comply with the testing requirements of Section 01 4000, Quality Control. Perform specified tests and testing in accordance with ACI 301, Section 1.6.4 and ACI 311 "Recommended Practice for Concrete Inspection". Testing Agency shall meet the requirements of ASTM E 329:
- B. Slump Tests: Consistency shall be determined at the project site by means of slump test in accordance with C-143. Results of slump test shall appear on the test reports. Slump tests shall be made at the same time as test cylinders are made and when so directed by the Structural Engineer.
- C. Compression Tests: Each test consists of 4 concrete test cylinders or 4 grout samples broken under compression. Two cylinders/samples shall be broken 7 days after making; and two cylinders/samples shall be broken at 28 days. Strength results of all cylinders/samples broken at 7 days shall achieve a minimum of 65% of the ultimate design strength, 28 days - 100%.
 - 1. Concrete Test Cylinders: 6" diameter x 12" (or 4" diameter x 8" if maximum aggregate size is less than 1") made at the point of deposit, molded, transported cured and tested in accordance with ASTM C-31. One set of compressive test cylinders shall be made for each 100 yards poured. Make not less than one set of cylinders for each day's pour and each class of concrete.
 - 2. Masonry Grout Samples: 3-1/2" square x 7" made at the point of deposit, molded, transported cured and tested in accordance with ASTM C1019-84 - "Standard Method of Sampling and Testing Grout". One set of grout cubes shall be made for each 30 yards poured. Make not less than one set of cubes for each day's pour.
- D. Density Test: When required, density test shall be performed in accordance with ASTM C-138.

- E. Air Content: When required, air content test shall be performed per ASTM C-173 (volumetric method for normal weight or light weight concrete) or ASTM C-231 (pressure method for normal weight concrete).
- F. Laboratory Test Reports: Submit to the Structural Engineer immediately upon completion of each test. Test reports shall contain the following information:
1. Exact mix, including quantities of admixtures, etc.
 2. Date of pour.
 3. Exact location of pour in building.
 4. Slump (at truck or on deck specified).
 5. Percentage of air-entrained.
 6. 7-day test results for first two cylinders tested.
 7. 28-day test results shall be reported with both 7 and 28 day results indicated on the same report.
 8. Temperature at time of pour.

G. TESTING LABORATORY DUTIES

1. Furnish all materials for making concrete test cylinders and grout cubes.
2. At test intervals, immediately transport concrete test cylinders, and masonry grout samples to the Test Laboratory.
3. Provide verbal results of concrete test cylinders when required by the Construction Manager.
4. Perform concrete density test when required by the Structural Engineer.
5. Provide test reports of all laboratory testing in a timely fashion to the Structural Engineer and Construction Manager.

H. INSPECTION AGENCY DUTIES

1. Comply with inspection requirements of Section 01 4000, Quality Control Services. Inspect concrete operations and completed work for conformance with Contract Documents and as indicated in ACI 301, Section 1.7.
2. Assign qualified personnel to be on site at all times when operations are scheduled. The Construction Manager shall note that no concrete operations shall be permitted in their absence.
3. Perform slump tests for all concrete, and masonry grout, and air content tests as specified above. Forward results of these tests to Testing Laboratory for incorporation into laboratory test reports.
4. Make concrete test cylinders in molds provided by Testing Laboratory and masonry grout samples using 3 blocks to form a 4" x 4" x 8" sample.
5. Site inspection of poured in placed concrete shall include, but is not limited to the following:
 - a. Insure all concrete and masonry reinforcement is properly inspected per specifications 03 2000 and Division 4 – Masonry
 - b. Masonry grouting operation.
 - c. Slab curing procedures.
 - d. Application of concrete hardener.
6. Submit daily reports outlining conformance and exceptions of concrete operation to contract documents.

3.17 CONTRACTOR'S RESPONSIBILITY

- A. Submit copies of all reports indicating conformance and exceptions to contract documents in

a timely fashion to Construction Manager for distribution to design consultants, owner, subcontractors and other interested parties.

- B. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 03 30 00

**SECTION 04 20 00
UNIT MASONRY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Clay face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Masonry-cell fill.

B. Products Installed, but not Furnished under this Section:

1. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Cavity wall insulation.

C. Related Requirements:

1. Section 04 73 00 "Manufactured Stone Masonry" for manufactured stone veneer.
2. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 07 21 00 "Thermal Insulation" for cavity wall insulation below slab.
4. Section 07 27 36 "Sprayed Foam Air Barrier" for cavity wall insulation and air barrier.
5. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For cement, mortar, CMU, and steel reinforcement: Product-specific declaration or Industrywide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For products having recycled content (CMU and steel): Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For products having regionally sourced recycled material (CMU and steel): Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For mortar, CMU and brick, if available: Material Ingredient Report.
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Samples for Initial Selection:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Colored mortar.
 - 3. Weep holes/cavity vents.
- E. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Special brick shapes.
 - 3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 4. Weep holes and cavity vents.
 - 5. Accessories embedded in masonry.

1.6 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. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size 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 according to ASTM C 67.
 - d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing according to ASTM C 67.
 - e. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Stainless steel flashing and accessories: Defense Federal Acquisition Regulation Supplement compliance.
 3. Integral water repellent used in CMUs.
 4. Cementitious materials. Include name of manufacturer, brand name, and type.
 5. Mortar admixtures.
 6. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 7. Grout mixes. Include description of type and proportions of ingredients.
 8. Reinforcing bars.
 9. Joint reinforcement.
 10. Anchors, ties, and metal accessories.
- D. 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 according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Stainless Steel Metals: Products meeting requirements of Defense Federal Acquisition Regulation Supplement.
- C. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
 2. Build sample panels facing south.
 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 4. Protect approved sample panels from the elements with weather-resistant membrane.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. If approved by Architect in writing, sample panel may also be reviewed for the following: relationship of mortar and sealant colors to masonry color; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities.
 - b. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.
- D. 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 mockups for typical exterior walls, as shown on Drawings, in sizes approximately 60 inches (1500 mm) long by 60 inches (1500 mm) high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.
 - b. Include lower corner of window opening, framed with FRP trim, at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
 - c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include metal studs, sheathing, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
 2. Clean one-half of exposed faces of mockups with masonry cleaner, as indicated.
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless Architect specifically approves such deviations in writing.
 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 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 (600 mm) down both sides of walls, and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least twelve (12) hours and concentrated loads for at least three (3) days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by 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.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Recycled Content: Provide CMU with minimum 10 percent fly ash.
 - 2. Recycled Content: Provide steel with minimum 75 percent total recycled content, including at least 60 percent post-consumer recycled content.
- B. Provide unit masonry that develops indicated net-area compressive strengths at twenty-eight (28) days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

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

2.4 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.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
- C. CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
 2. Density Classification: Normal weight unless otherwise noted.
 - a. Lightweight with pumice, expanded slag, expanded shale, expanded clay, or expanded slate aggregate, as required to provide 2-hour fire resistance rating for 3.6 inch thick units.
 3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs
1. Locations:
 - a. 6" CMU walls.
 - b. Lintels not visible in finished work.
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, 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.
1. Locations:
 - a. All precast lintels indicated on Drawings.

2.6 BRICK

- 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.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Products: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - a. Basis-of-Design: Belden Brick Company.
 - 1) BK-1: Commodore Full Range Smooth.
 - 2) BK-2: 407-479 Light Range Smooth.
 - 3) BK-3: Black Diamond Velour.
 - b. Endicott.
 - 1) BK-1: Blend 80% Burgundy Blend Smooth and 20% Dark Sandstone Smooth.
 - 2) BK-2: Desert I/S Smooth.
 - 3) BK-3: Manganese I/S Smooth.
 - c. Yankee Hill.
 - 1) BK-1: Blend 60% Medium Red Smooth, 20% Light Red Smooth, and 20% G-3 Smooth.
 - 2) BK-2: Mojave Smooth.
 - 3) BK-3: Capital I/S Smooth.
2. Blends: Brick selections noted as blends of two (2) or more selections shall be blended by manufacturer prior to shipping.
3. Grade: SW.
4. Type: FBX.
5. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 15,000 psi (103 MPa).
6. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
7. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
8. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
9. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
10. Application: Use where brick is exposed unless otherwise indicated.

2.7 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- E. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Colored Portland Cement-Lime Mix:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Essroc; Riverton Portland Cement Lime Custom Color.
 - 2) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 3) Lehigh Hanson; Heidelberg Cement Group; Lehigh Custom Color Portland/Lime Cement.
 - 2. Colored Masonry Cement:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Essroc; Brixment-in-Color or Flamingo Color Masonry Cement.
 - 2) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
 - 3) Lehigh Hanson; Heidelberg Cement Group; Lehigh Custom Color Masonry Cement.
 - 3. Subject to compliance with requirements, colored cement product matching DCMU provided by DCMU manufacturer may be submitted for use.
 - 4. Color:
 - a. Face Brick BK-1 and BK-2: flamingo-BRIXMENT, C-412.
 - b. Face Brick BK-3 (Head Joints Only): flamingo-BRIXMENT, C-70.
 - c. Manufactured Stone Masonry MSM-1, MSM-2, and MSM-3: flamingo-BRIXMENT, C-380.
 - d. Mortar colors selected for products by Belden Brick and Rockcast. If products by another listed manufacturer are provided, Architect may reselect mortar colors.
 - 5. Formulate blend, as required, to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 6. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Aggregate for Mortar: ASTM C 144.

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 (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) 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.
- G. Aggregate for Grout: ASTM C 404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- J. Water: Potable.

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
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 (3.77-mm) diameter.
 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
 7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder 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 (100 mm) wide, plus one side rod at each wythe of masonry 4 inches (100 mm) wide or less.
 - a. Location: Interior walls with multiple wythes of concrete masonry.
 2. Tab type, ladder 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 (16-mm) cover on outside face.

- a. Location: Interior walls with multiple wythes of concrete and clay masonry
- 3. Adjustable (two-piece) type, ladder 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 (1.5 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe, but with at least 5/8-inch (16-mm) cover on outside face.
 - a. Location: Exterior walls.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer, but with at least a 5/8-inch (16-mm) cover on outside face.
 - 1. Corrugated-metal ties and mesh ties are not acceptable for use in any application.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 4. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
 - 5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 6. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units.
 - 2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
 - 3. Wire: Fabricate from 3/16-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment, but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
- E. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- G. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment, but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
 2. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire, unless otherwise indicated.
 3. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having holes for inserting vertical legs of wire tie formed to fit anchor section.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; HB-213.
 - 2) Heckman Building Products; #213.
 - 3) Wire-Bond; RJ-711.
 - b. Material: Stainless Steel, type 304, minimum 14 gage.
 - c. Wire ties: Double pintel wire tie, as recommended in writing by anchor manufacturer.
 - d. Locations: Provide at all locations unless otherwise noted.
 4. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; DW-10.
 - 2) Hohmann & Barnard, Inc.; 345-BT.
 - 3) Heckmann Building Products; #315-D.
 - 4) Wire-Bond; #1004 Type III.
 - b. Material: Steel, hot-dipped galvanized after fabrication.
 - c. Wire ties: Dovetail anchor, 3/16-inch diameter wire.
 - d. Locations: At interior walls where masonry is veneered over stud backup.
 5. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954, except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.
 - a. Locations: Interior screw-attached, masonry-veneer anchors only.
 6. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless-steel shank.

- a. Locations: All locations unless otherwise noted.

2.10 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual," Section 07 62 00 "Sheet Metal Flashing and Trim," and as follows:
 - 1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304, 0.016 inch (0.40 mm) thick.
 - 2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
 - 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 - 4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 - 5. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 - 6. Solder metal items at corners.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 - 1. Stainless Steel Fabric Flashing: 0.003 inch thick, type 304 stainless steel sheet coated with flexible polymeric fabric. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hohmann & Barnard, Inc.; Mighty-Flash.
 - 2) Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing.
 - 3) Prosoco, Inc.; R-Guard SS ThruWall.
 - 4) STS Coatings, Inc.; Wall Guardian Stainless Steel TWF.
 - 5) TK Products, Inc.; TK-SS Flashing.
 - 6) York Manufacturing, Inc.; Multi-Flash SS.
- C. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with a metal drip edge or snaplock receiver where noted.
 - 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.
- E. Solder and Sealants for Sheet Metal Flashings:
 - 1. Solder for Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.

2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- F. 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.
- G. Termination Bars for Flexible Flashing: Stainless steel bars 1/8 inch by 1 inch (3 mm by 25 mm).
- H. Termination Bars for Flexible Flashing: Stainless-steel sheet 0.019 inch by 1-1/2 inches (0.48 mm by 38 mm) with a 3/8 inch (10-mm) sealant flange at top.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use the following unless otherwise indicated:
 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Mortar Maze Cell Vent.
 - 2) Heckmann Building Products, Inc.; No. 85 Cell Vent.
 - 3) Hohmann & Barnard, Inc.; QV Quadro-Vent.
 - 4) Wire-Bond; Cell Vent (#3601).
- E. Cavity Drainage Material: Free-draining breathable mesh, made from polymer strands covered with non-woven fabric that will not degrade within the wall cavity.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Advanced Building Products Inc.; Morairvent CW.
 - b. Keene Building Products; Cav-air-ator.
 2. Configuration: Provide the one of the following:
 - a. Sheets or strips, full depth of cavity and installed to full height of cavity.
 - b. Sheets or strips not less than 3/4 inch (19 mm) thick and installed to full height of cavity, with additional strips 4 inches (100 mm) high at weep/vent holes and thick enough to fill entire depth of cavity and prevent weep/vent holes from clogging with mortar.

3. Fire Resistance when tested according to ASTM E 84: Class A.

2.12 MASONRY-CELL FILL

- A. Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

2.13 MASONRY CLEANERS

- A. 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 cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Provide non-acidic cleaner if recommended in writing by manufacturer of masonry units.
 2. If multiple cleaner products are recommended by masonry unit manufacturers, each shall be used only on substrates as indicated by manufacturer.

2.14 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 portland cement-lime mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime mortar.
 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 5. 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 C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 1. For masonry below grade or in contact with earth, use Type M.
 2. For reinforced masonry, use Type S or Type N.
 3. For mortar parge coats, use Type S or Type N.
 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. 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 shall not exceed 10 percent of portland cement by weight.
 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 3. Mix to match approved sample.

4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

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

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) 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 (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in Flemish bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: 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.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. 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.
- G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. 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 (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) 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 07 84 43 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 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 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. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Wet joint surfaces thoroughly before applying mortar.
 - 3. Rake out mortar joints for pointing with sealant.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- F. Cut joints flush where indicated to receive spray foam air barriers unless otherwise indicated.

3.6 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together as follows:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. (0.16 sq. m) of wall area spaced not to exceed 16 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (914 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 - 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement.
- B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.
- C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
 - 1. Provide continuity with masonry-joint reinforcement at corners by using prefabricated L-shaped units, as well as masonry bonding.
- D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.

2. Provide rigid metal anchors not more than 24 inches (610 mm) o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.7 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 1. Individual Metal Ties: Provide ties, as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. (0.16 sq. m) of wall area spaced not to exceed 16 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
 - a. Use adjustable-type (two-piece-type) ties.
 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.
 3. 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 (300 mm) 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 shown.
 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Embed tie sections 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 (406 mm) o.c. vertically and 16 inches (406 mm) o.c. horizontally, with not less than one anchor for each 1.77 sq. ft. (0.16 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 24 inches (610 mm), around perimeter.

- B. Provide not less than 1-1/2 inch (25 mm) of airspace between back of masonry veneer and face of spray foam air barrier.
 - 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.

3.9 MASONRY-CELL FILL

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

3.10 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
- 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. Rigid anchors may be provided for continuity at wall intersections and corners in lieu of prefabricated T-shaped and L-shaped units.
- F. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.11 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

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

3.12 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. Spacing: Provide control joints at locations indicated on Drawings. Where joints are not indicated, provide as follows:
 - 1. For CMU walls and partitions, provide control joints per recommendations in NCMA TEK 10-1A "Crack Control in Concrete Masonry" and NCMA TEK 10-2C "Control Joints for Concrete Masonry Walls – Empirical Method."
 - 2. For CMU veneers, provide control joints per recommendations in NCMA TEK 10-4 "Crack Control for Concrete Brick and Other Concrete Masonry Veneers."
 - 3. For brick veneer, provide expansion joints per recommendations in BIA Technical Note 18A "Accommodating Expansion of Brickwork" and as shown on Drawings.
- C. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.
- D. Form expansion joints in brick as follows:
 - 1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

3.13 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels at 5-5/8 inch thick walls shown without structural steel or other supporting lintels.
- C. Where not exposed in finished work and where other lintels are not shown, provide steel, concrete, or masonry lintels where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- D. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.14 FLASHING, WEEP HOLES, AND CAVITY VENTS

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

- B. Install flashing as follows, unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to within 1/2 inch (13 mm) of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
 3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and 1-1/2 inches (38 mm) into the inner wythe. Form 1/4-inch (6-mm) hook in edge of flashing embedded in inner wythe.
 4. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge under spray foam air barrier, lapping at least 4 inches (100 mm). Fasten upper edge of flexible flashing to sheathing through termination bar and termination sealant.
 5. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge with sealant.
 7. Along sidewalks, cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/cavity vent products to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c. maximum unless otherwise indicated.
- E. Place grout in cavities to a height equal to height of first course below bottom of base flashing.
- F. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- G. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.15 REINFORCED UNIT MASONRY INSTALLATION

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

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
- C. Refer to Drawing S601 for additional testing requirements.

3.17 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry 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 cleaner applied according to manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.

3.18 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

**SECTION 04 72 00
CAST STONE MASONRY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cast-stone trim.

- B. Related Sections:

- 1. Section 04 20 00 "Unit Masonry" for installing cast-stone units in unit masonry.
 - 2. Section 04 73 00 "Manufactured Stone Masonry."
 - 3. Section 07 92 00 "Joint Sealants" for pointing sealants.

1.3 ACTION SUBMITTALS

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

- 1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. LEED Submittals: Comply with Section 01 81 13.

- 1. MR Credit 2: BPDO – Environmental Product Declarations.

- a. For cement mortar: Product-specific declaration or Industry-wide EPD or product-specific EPD.

- 2. MR Credit 3: BPDO – Sourcing of Raw Materials.

- a. For recycled content cast stone: Documentation indicating percentages by weight of preconsumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced cast stone: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

- C. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

- 1. Include building elevations showing layout of units and locations of joints and anchors.

- D. Samples for Verification:

1. For each color and texture of cast stone required, 10 inches (250 mm) square in size.
2. For each trim shape required, 10 inches (250 mm) in length.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
 1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.
 1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 04 20 00 "Unit Masonry."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
 2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven (7) days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one (1) source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors, as needed to produce required cast-stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors, as needed to produce required cast-stone textures and colors.
- E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
 3. Air-Entraining Admixture: ASTM C 260/C 260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
 6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized reinforcement when covered with less than 1-1/2 inches (38 mm) of cast-stone material.

1. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.3 CAST-STONE UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Arban Precast Stone.
 2. Cast Stone Systems, Inc.
 3. Custom Cast Stone.
 4. Hoyle Stone Products.
 5. Reading Rock; RockCast.
 6. Russell Cast Stone.
 7. Sun Precast Company.
- B. Cast-Stone Units: Comply with ASTM C 1364.
 1. Units shall be manufactured using the vibrant dry tamp or wet-cast method.
 2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 3. Provide drips on projecting elements unless otherwise indicated.
- D. Fabrication Tolerances:
 1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.
- E. Cure Units as Follows:
 1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
 2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five (5) days at mean daily temperature of 70 deg F (21 deg C) or above.
 - b. No fewer than six (6) days at mean daily temperature of 60 deg F (16 deg C) or above.

- c. No fewer than seven (7) days at mean daily temperature of 50 deg F (10 deg C) or above.
 - d. No fewer than eight (8) days at mean daily temperature of 45 deg F (7 deg C) or above.
- F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G. Colors and Textures:
 - 1. Color 1: Match approved color of manufactured stone masonry, as specified in Section 04 73 00.
 - 2. Color 2: Custom color to match approved color of face brick BK-1, as specified in Section 04 20 00.
 - 3. Texture: Smooth, to match approved texture of smooth manufactured stone masonry, as specified in Section 04 73 00.

2.4 MORTAR MATERIALS

- A. Provide mortar materials that comply with Section 04 20 00 "Unit Masonry."

2.5 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- (12-mm-) diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- C. Non-Acidic Cleaner: Cleaner as recommended in writing by cast stone manufacturer 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 cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.6 MORTAR MIXES

- A. Comply with requirements in Section 04 20 00 "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, 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.

3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Keep cavities open where unfilled space is indicated between back of cast-stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.
 - 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast-stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
 - 1. Form open joint of width indicated, but not less than 3/8 inch (10 mm).
- F. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - a. Use non-acidic cleaner only where hand-cleaning methods are ineffective.

END OF SECTION 04 72 00

**SECTION 04 73 00
MANUFACTURED STONE MASONRY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Manufactured stone masonry veneer.
- B. Related Sections include the following:
 - 1. Section 04 20 00 "Unit Masonry" for mortar and grout.
 - 2. Section 04 72 00 "Cast Stone."
 - 3. Section 07 92 00 "Joint Sealants."

1.3 DEFINITIONS

- A. Manufactured Stone Masonry Veneer: An architectural stone unit manufactured to copy fine grain texture and color of natural cut stone. Meets ASTM C 90 requirements.
- B. Dry Cast Concrete Products: Manufactured from zero-slump concrete.
- C. Machine Casting Method: Vibratory compaction by machine of earth-moist, zero-slump concrete against rigid mold until it is densely compacted.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials.
 - a. For recycled content cast stone: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced cast stone: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions; details for reinforcement and anchorages, if any; and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

D. Samples for Verification:

1. For each color and texture of cast stone required, 12 inches (305 mm) square in size.
2. For each mortar color required, showing the full range expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label samples to indicate type and amount of colorant used. Provide sample for masonry mock-up panel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of cast stone with requirements indicated.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Sufficient plant facilities to provide quality, shapes, quantities, and sizes of architectural stone units required without delaying progress of the Work.
2. Minimum of 10 years' experience in producing masonry units.
3. Custom Cast Stone Series and Architectural Masonry Veneer Series are to be manufactured from a similar mix design to match color and texture.
4. Manufacturer shall have an internal Quality Assurance Testing Program with certified laboratory technician(s).

B. Sample Panels: Build sample panels of each supplier's product to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.

1. Build sample panels for each type of manufactured stone masonry construction in sizes approximately 72 inches (2000 mm) long by 72 inches (2000 mm) high.
 - a. Build the following sample panels of each supplier's manufactured stone masonry.
 - 1) From top to bottom: one course each MSM-2, MSM-3, MSM-2, MSM-1, MSM-2, MSM-3
 - 2) Length: 6 feet.
2. Clean one-half of exposed faces of panels with masonry cleaner indicated.
3. Protect approved sample panels from the elements with weather-resistant membrane.
4. Erection of sample panels is for final product selection based on color, texture, and blending of masonry units; relationship of mortar to masonry unit colors and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.

C. Mockup: Prior to installing manufactured stone masonry, construct mockup wall panels to verify selections made under sample submittals and from sample panels to demonstrate aesthetic effects of materials and execution. Build mockups to comply with the following requirements, us-

ing materials indicated for final unit of Work.

1. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect.
2. Build mockup of typical wall area as shown on drawings.
 - a. Include sealant-filled joint complying with requirements of Division 7 Section "Joint Sealants."
3. Build mockups for each of the following types of manufactured stone masonry in sizes approximately 6' long by 5' 4" high by full thickness, including face and back-up wythes, as well as accessories. Coordinate panel make-up with Architect.
 - a. Typical exterior face of wall as designated on drawings.
4. Clean exposed faces of mockups with masonry cleaner indicated.
5. Notify Architect one week in advance of the dates and times when mockups will be constructed.
6. Protect accepted mockups from the elements with weather-resistant membrane.
7. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - 1) Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver architectural stone units secured to shipping pallets and protected from damage and discoloration.
2. Provide itemized shipping list.
3. Number each piece individually, as required, to match shop drawings and schedules.

B. Storage:

1. Store architectural stone units and installation materials in accordance with manufacturer's instructions.
2. Store architectural stone units on pallets with non-staining, waterproof covers.
3. Do not double stack pallets.
4. Ventilate units under covers to prevent condensation.
5. Prevent contact with dirt and splashing.

C. Handling:

1. Protect architectural stone units, including corners and edges, during storage, handling, and installation to prevent chipping, cracking, staining, or other damage.
2. Handle long units at center and both ends simultaneously to prevent cracking.
3. Do not use pry bars or other equipment in a manner that could damage units.

1.7 COORDINATION

- A. Coordinate production and delivery of cast stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Custom Cast Stone; Masonry Veneer CCS-112 and CCS-104 / CCS-RF104.
2. Rockcast; Modular Veneer Units, Smooth ST004 and ST003 and Chiseled ST204.
3. Shouldice; Tex-Stone and Rock-Stone.

- B. Substitutions: Requests for substitutions shall be made in writing at least ten (10) days prior to the date of the Bid Opening and in accordance with Instructions to Bidders and shall include the following information.

1. Product Data.
2. Material Test Reports.
3. Three samples each of smooth and chiseled/rockface units showing proposed color.

2.2 MANUFACTURED STONE MASONRY VENEER (**MSM-1, MSM-2, MSM-3**)

- A. Compliance: ASTM C 90.

- B. Casting Method: Machine.

- C. Color: Match Rockcast Buff Stone.

- D. Size and Texture:

1. Type MSM-1: Size: 3-5/8 x 11-5/8 x 23-5/8, smooth.
2. Type MSM-2: Size: 3-5/8 x 3-5/8 x 23-5/8, chiseled / rockface.
3. Type MSM-3: Size: 3-5/8 x 7-5/8 x 23-5/8, smooth.

- E. Test Results:

1. Compressive Strength, ASTM C 140: 4,000 - 6,000 psi at 28 days.
2. Absorption, ASTM C 140: Less than 6 percent at 28 days.
3. Linear Shrinkage, ASTM C 426: Maximum .065 percent.
4. Density, ASTM C 140: Greater than 120 pounds per cubic foot.

- 5. Freeze-Thaw, ASTM C 666: Less than 5 percent cumulative mass loss after 300 cycles.
- F. Curing: Cure in enclosed chamber at 95 percent relative humidity and 95 to 120 degrees F for 12 to 18 hours and yard cure for 350 degree-days.

2.4 ARCHITECTURAL STONE VENEER MATERIALS

- A. Portland Cement: ASTM C 150, Type I or III. White and/or gray as required to match specified color.
- B. Coarse Aggregates: ASTM C 33, except for gradation. Granite, quartz, or limestone.
- C. Fine Aggregates: ASTM C 33, except for gradation. Manufactured or natural sands.
- D. Pigments: ASTM C 979, except do not use carbon black pigments. Inorganic iron oxide pigments.
- E. Water Reducing, Retarding, and Accelerating Admixtures: ASTM C 494.
- F. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
- G. Water: Potable.

2.5 TEXTURE AND COLOR

- A. General: Match texture and color of full-size sample on file with Architect.
- B. Texture of Surfaces Exposed to View:
 - 1. Fine-grained texture similar to natural stone and architectural stone units.
 - 2. Approximately equal to approved sample when viewed in direct daylight at ten (10) feet.
- C. Surface Air Voids:
 - 1. Size: Maximum 1/32 inch.
 - 2. Density: Less than three (3) occurrences per any one (1) square inch.
 - 3. Viewing Conditions: Not obvious under direct daylight at ten (10) feet.
- D. Finish:
 - 1. Minor chips shall not be obvious under direct daylight at twenty (20) feet, as determined by Architect.
 - 2. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- E. Color Variation:
 - 1. Viewing Conditions: Compare in direct daylight at ten (10) feet, between units of similar age, subjected to similar weathering conditions.

2.6 MORTAR

- A. Mortar: As specified in Section 04 20 00.
- B. Mortar Materials: As specified in Section 04 20 00.

2.7 ACCESSORIES

- A. Anchors: Non-corrosive type, sized for conditions. Type 304 stainless steel.
- B. Sealant: As specified in Section 07 92 00.
- C. Cleaner: Prosoco Sure Klean Custom Masonry Cleaner, Prosoco Sure Klean 600 Detergent, or Prosoco Sure Klean Vana Trol.

2.8 FABRICATION

- A. Shapes: As indicated on drawings.

2.9 TOLERANCES

- A. General: Manufacture architectural stone units within tolerances in accordance with ASTM C 90, unless otherwise specified.
- B. Length, height, width: Do not deviate by more than plus or minus 1/8 inch from approved dimensions. These requirements do not apply to split faced units.

2.10 PRODUCTION QUALITY CONTROL

- A. Mix Designs: Test new and existing mix designs for applicable compressive strength and absorption compliance before manufacturing architectural stone units.
- B. Plant Production Testing: Tests to be conducted by certified laboratory testing technicians. Test from specimens selected at random from plant production in accordance with ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine construction to receive architectural stone units. Notify Architect if construction is not acceptable. Do not begin installation until unacceptable conditions have been corrected.
- B. Examine architectural stone units before installation. Do not install unacceptable units.

3.2 INSTALLATION

- A. Install units in conjunction with masonry, as specified in Section 04 20 00.
- B. Pull units from multiple cubes during installation to minimize variation in color and help with natural blending.

- C. Cut units using motor-driven masonry saws. Finished ends should be turned to the visible side and the saw cut turned to the inside of the mortar joint to hide exposed aggregates and saw marks.
- D. Do not use pry bars or other equipment in a manner that could damage units.
- E. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- F. Use Type N mortar (ASTM C 270), unless specified otherwise.
- G. Per ACI 530.1, it is not necessary, nor recommended, to wet the units prior to installation.
- H. Set units in full bed of mortar, unless otherwise indicated on the drawings.
- I. Fill vertical joints with mortar.
- J. Make joints 3/8 inch, unless otherwise indicated on the drawings.
- K. Tuck point mortar joints to slight concave profile (unless specified otherwise).
- L. Remove excess mortar immediately.
- M. Remove mortar fins and smears before tooling joints.
- N. Cover wainscot for protection and bond separation with plastic, felt paper or other approved products.
- O. Cover freshly installed masonry products as required to assist with the curing process.
- P. Sealant Joints:
 - 1. As specified in Section 07 92 00.
 - 2. Prime ends of units, insert properly sized backing rod, and install sealant.
 - 3. Provide sealant joints at following locations:
 - a. Joints at relieving angles.
 - b. Control and expansion joints.
 - c. As indicated on the drawings.

3.3 TOLERANCES

A. Installation Tolerances:

- 1. Variation from Plumb: Do not exceed 1/8 inch in 5 feet or 1/4 inch in 20 feet or more.
- 2. Variation from Level: Do not exceed 1/8 inch in 5 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- 3. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch or 1/4 of nominal joint width, whichever is greater.
- 4. Variation in Plane Between Adjacent Surfaces: Do not exceed 1/8-inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 CLEANING

- A. Clean exposed units after mortar is thoroughly set and cured.
- B. Perform test of cleaner on small area of 4' x 4' on each type and color and receive approval by Architect before full cleaning. Let test area dry 4 to 5 days before inspection. Keep test area for future comparison.
- C. Clean units by wetting down the surface first, before using the specified cleaner (as specified in Section 2.7.C). Brush on cleaner, let dwell for 2 to 3 minutes. Reapply cleaner, scrub surface with masonry brush and rinse off thoroughly. Areas with heavy soiling use a wood block or non-metallic scraper.
- D. Apply cleaner to units in accordance with cleaner manufacturer's instructions.
- E. Do not use the following to clean units:
 - 1. Muriatic acid.
 - 2. Power washing.
 - 3. Sandblasting.
 - 4. Harsh cleaning materials or methods that would damage or discolor surfaces.

3.5 REPAIR

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at twenty (20) feet.
- B. Repair with touchup materials provided by manufacturer in accordance with manufacturer's instructions.
- C. Repair methods and results to be approved by Architect.

3.6 INSPECTION AND ACCEPTANCE

- A. Inspect completed installation in accordance with ACI 530 requirements.

3.7 PROTECTION

- A. Protect installed units from splashing, stains, mortar, and other damage.

END OF SECTION 04 73 00

**SECTION 05 21 00
STEEL JOISTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SECTION INCLUDES

- A. Short spans and long span joists
- B. Bridging, anchorages, headers and framing required to make a complete and rigid job.
- C. Wall anchors at the ends of each line of bridging.
- D. Shop painting, cleaning and touch-up of paint at field welds and at other points where shop coat is damaged.

1.3 RELATED WORK

- A. All other sections of Division 5, Metals.

1.4 DESIGN CRITERIA

- A. Building structure designed based on SJI. joist sizes selected and shown on the drawings.
- B. Allowable Deflection: Design and fabricate for a maximum deflection of L/360 of the clear span including the required uniform live load, for all areas having suspended ceilings below.
- C. Top Chords: Design for combined bending and direct stresses for live and dead loads. Top chord extensions shall extend back into joist to fully develop bending and shear stresses.
 - 1. In addition, steel joists furnished shall be designed to support the special loading requirements indicated on the drawings.
- D. Wind Uplift: All bar joists shall be designed to resist a net wind uplift of 57 psf at all overhang areas, 35 psf for a 12'-0" width around the entire building perimeter, and 15 psf for all other roof areas. Locate bridging near the first bottom chord panel point and design all joist members to satisfy this additional loading condition.

1.5 QUALITY ASSURANCE

- A. Joists: Fabricated in compliance with the references, specifically the requirements of span and loading as indicated by joist designation on the drawings.
- B. Manufacturers Qualifications: Member Steel Joist Institute.
- C. Welding Qualifications: Qualify welding processes and welders in accordance with the AWS - "Standard Qualification Procedure."

1.6 REFERENCES

- A. Steel Joist Institute (SJI.):
 - Standard Specifications and Load Tables - Open Web Steel Joists
 - Short Span Steel Joists - K Series
 - Long Span Steel Joists - LH Series
- B. American Institute of Steel Construction (AISC): "Manual of Steel Construction", 14th Edition.
- C. American Iron and Steel Institute (AISI): Specification for the Design of Cold-Formed Steel Structural Members.
- D. Steel Structures Painting Council (SSPC): Steel Structures Painting Manual, Volume 1 and Volume 2, Systems and Specifications, by Steel Structures Painting Council.
- E. American Welding Society (AWS): D1.1 Structural Welding Code Standard Qualification Procedures

1.7 SUBMITTALS

- A. Shop Drawings: Show layout of joist units, special connections, jointing and accessories. Include the mark, number, type, location and spacing of joists and bridging. **Please note that the Contract Documents in CADD format will not be made available to the construction manager for their use in the preparation of the shop drawings, unless a release is signed.**
- B. Certification: That joists comply with "AISC-SJI. Specifications".
- C. Product Data: Specifications and installation instructions for each type of joist and its accessories.
- C. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating location of extraction, manufacture, purchase of primary raw materials. Include material cost value.

1.8 DELIVERY, STORAGE HANDLING

- A. Product Handling: As recommended in "AISC-SJI. Specifications". Handling and storage: Prevent deformation of members and excessive stresses.

PART 2 – PRODUCTS

2.0 LEED REQUIREMENTS

- A. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:
 - 1. Plate and Bar: Minimum 30 percent total recycled content.
 - 2. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - 3. Steel Pipe: Minimum 30 percent total recycled content.
 - 4. All other Steel Materials: Minimum 30 percent total recycled content.

- B. Regional Materials: Provide minimum 25 percent of steel manufactured and of primary raw materials extracted or recovered within 100 mile radius of Project Site.

2.1 MATERIALS

- A. Steel: Comply with "AISC-SJI. Specifications:

- B. Threaded Fasteners:

1. ASTM A-325 heavy hexagon structural bolts with nuts and hardened washers.

- C. Prime Paint: AISC-SJI. Specifications, Type I Grey oxide; Type II Asphaltic not permitted.

1. Manufacturers:

- Tnemec Company – Series 88HS Azerox HS Primer
- Or approved equal

2.2 SHORT SPAN STEEL JOISTS (K SERIES)

- A. Design and fabricate in accordance with "AISC SJI. Standard Specifications and Load Tables for Short Span Steel Joists, K-Series."

- B. Bearing Ends: Extend a minimum distance of 2-1/2 inches on steel supports, and a minimum of 4 inches on masonry and concrete supports.

2.3 LONG SPAN STEEL JOIST (LH & DLH SERIES)

- A. Design and fabricate in accordance with "AISC SJI. Standard Specifications and Load Tables for Long Span Steel Joist, LH & DLH Series."

- B. Bearing Ends: Extend a minimum distance of 4 inches on steel supports, and a minimum of 6 inches on masonry and concrete supports.

2.4 FABRICATION

- A. General: Fabricate in accordance with "AISC-SJI. Specifications."

1. Camber: Fabricate joists with camber as noted or indicated on drawings.

- B. Extended Ends: Provide top chord extended ends on joists; design to support uniform loads indicated in "SJI. Specifications and Load Tables."

1. Design as cantilever beams with reactions carried back to not less than the first panel point of the joists.
2. Cantilevered extended ends shall be designed for a maximum live load deflection of the cantilevered length divided by 240 ($L_c/240$).

- C. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord.

1. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards.
2. Sufficient strength to support the ceiling construction within deflection limit indicated.
3. Extend ends to within 1" of the finished wall surface, unless otherwise indicated.

- D. End Anchorage and Bearing Plates: Provide end anchorages to secure joists to adjacent construction, comply with "AISC-SJI. Specifications" except as indicated.
 - 1. Include beveled end bearings for installations where slope exceeds 1/4 inch (6.35 mm) in 12 inches (304.8 mm).
- E. Header Units: Provide header units to support tail joists at openings in floor or roof system.
- F. Bridging and Sag Rods: Provide bridging, sag rods and anchors for ends of lines, terminate at walls or beams.
- G. Shop Painting: Shop paint all steel joists and joist girders except members or portion of members to be embedded in concrete or sprayed on fireproofing. Paint embedded steel on exposed portions and initial 2 inches of embedded areas only.
 - 1. Remove loose scale, heavy rust, and other foreign materials from joists and accessories before application of shop paint in accordance with SSPC SP-2 "Hand Tool Cleaning" and SP-3 "Power Tool Cleaning."
 - 2. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning."
 - 3. Apply one shop coat of rust inhibitive prime paint to steel joists and accessories, by spray, dipping, or other method.
 - 4. Provide continuous minimum dry film thickness of not less than 1.0 mils.
 - 5. Another coat shall be applied, at the time of erection, if the original protection has deteriorated in any manner.
 - 6. Install finish paint to all surfaces of joist prior to erection per spec section 051200, paragraph 2.1.L.2 and 2.3.C.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Erector must examine the areas and conditions under which steel joists are to be installed and provide notification in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 ERECTION

- A. Placing Joists: Place and secure steel joist in accordance with "AISC-SJI. Specifications" and as herein specified. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
 - 1. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
 - 2. Do not place construction loads upon joists, until joists and bridging are securely in place.
 - 3. Maximum spacing of joists is shown in plans on the structural drawings. Joists shall be spaced less than maximum distance shown in plans where it is necessary to avoid pipes, openings, parallel partitions, etc.
 - 4. Set joists accurately, in proper locations. Alignment of each joist in place shall not deviate more than 3/8" in 10 feet from a straight line.
 - 5. Bearing surfaces of the joists shall be in the same plane with full bearing on supports and anchored as indicated. For joist ends bearing on masonry, provide solid level bearing of 8" minimum depth filled with concrete.
 - 6. Strut joists at columns shall have top chords bolted to structural members and the bottom

chords shall be extended. The top chords shall be welded to structural members after field adjustments. See structural details.

B. Attachment:

1. Welding: Field weld joists to supporting steel frame work in accordance with AISC-SJI. Specifications for the type of joists used. Coordinate welding sequence and procedure with the placing of joists.
2. Anchors: Furnish anchor bolts and other devices to be built into concrete and masonry construction. Furnish templates for accurate location of anchors to other work. Hook anchors not permitted.

C. Bridging:

1. Install bridging immediately after joists are erected. Brace end joists laterally by anchors or ties at each line of bridging.
2. Type as noted or detailed on structural drawings. Bridge both bottom and top chords. Weld all bridging.
 - a) Install parallel bridging for short span joist and promptly after placing joist.
 - a) Where 4 or 5 rows of bridging are required, a row nearest the midspan of the joist shall be diagonal bridging with bolted connections at chords and intersections.
3. Interruption of bridging: (e.g. ducts, suspended HVAC units, recessed light fixtures, etc.) Provide bridging at each end of such items that will overlap line of standard bridging.
4. Joists to be exposed in finished areas: Erect bridging in line with all sections straight, neatly installed and coordinated with building features.

3.3 PROTECTION

- A. Distribute all construction loads so that carrying capacity of each joist is not exceeded.
- B. Joists shall not be moved or cut, after permanently set, except under written direction of the Architect.

3.4 DEFECTIVE WORK

- A. Joists with bent chords or web members, poor welds or other defects, will be rejected and must be replaced with material meeting these specifications.

3.5 TOUCH-UP PAINTING

- A. After joist installation, paint all field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members per spec section 051200, paragraph 3.2.H. Wire brush surfaces and clean with solvent before painting. Use the same type of paint as used for shop painting.

3.6 INSPECTION AND TESTING

- A. General: Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of the steel joists for testing purposes will be borne by the Owner if welds are found to be satisfactory. Expense of removal and replacement of any work found to be defective, with new acceptable work, is the contractor's responsibility.
 1. The Owner shall employ and pay for an inspection agency approved by the Architect to inspect the joist.
 2. Documents: Provide the inspection agency with a complete set of Contract Documents and approved shop drawings before the work is started.

3. Notification: The contractor shall notify the inspection agency before the start of erection of steel joists in order that the inspector may properly schedule the required inspections.

B. Mill Test Reports:

1. Furnish the inspection agency a copy of the certified mill test reports of chemical analysis and physical test for each heat number of structural steel.
2. Furnish an affidavit (six copies) from steel manufacturer, stating that steel furnished for the project complies with the specifications.

C. Shop Inspection includes:

1. General inspection of the joist fabrication, including welding and required camber.
2. Shop inspection shall be made in the field prior to erection of joist.
3. Mill Certificates shall be reviewed and approved by the inspection agency prior to fabrication.

D. Field Inspection includes:

1. Setting of bearing plates when required.
2. Field welding of joists to supports.
3. Bridging installation and materials.
4. Anchorage requirements called for on the drawings.
5. Alignment of adjacent joists.
6. Field touch-up of paint and painting of field welds prior to placement of deck.

E. Written Certification:

1. Upon completion of the installation of all steel joists, the inspection agency shall submit written certification that the joists as manufactured meet all the requirements of the Contract Documents.

3.7 CONTRACTOR'S RESPONSIBILITY

- A. Acceptance of the shop and field inspection done by the testing agency pertaining to the structural steel, does not relieve the contractor of his responsibility to ensure that the project has the proper sizes, strength, fabrication and erection procedures and any other requirements of the Contract Documents.
- B. Submit copies of all reports indicating conformance and exceptions to contract documents in a timely fashion to contractor for distribution to design consultants, owner, subcontractors and other interested parties.
- C. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 05 21 00

**SECTION 05 21 00
STEEL JOISTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SECTION INCLUDES

- A. Short spans and long span joists
- B. Bridging, anchorages, headers and framing required to make a complete and rigid job.
- C. Wall anchors at the ends of each line of bridging.
- D. Shop painting, cleaning and touch-up of paint at field welds and at other points where shop coat is damaged.

1.3 RELATED WORK

- A. All other sections of Division 5, Metals.

1.4 DESIGN CRITERIA

- A. Building structure designed based on SJI. joist sizes selected and shown on the drawings.
- B. Allowable Deflection: Design and fabricate for a maximum deflection of L/360 of the clear span including the required uniform live load, for all areas having suspended ceilings below.
- C. Top Chords: Design for combined bending and direct stresses for live and dead loads. Top chord extensions shall extend back into joist to fully develop bending and shear stresses.
 - 1. In addition, steel joists furnished shall be designed to support the special loading requirements indicated on the drawings.
- D. Wind Uplift: All bar joists shall be designed to resist a net wind uplift of 57 psf at all overhang areas, 35 psf for a 12'-0" width around the entire building perimeter, and 15 psf for all other roof areas. Locate bridging near the first bottom chord panel point and design all joist members to satisfy this additional loading condition.

1.5 QUALITY ASSURANCE

- A. Joists: Fabricated in compliance with the references, specifically the requirements of span and loading as indicated by joist designation on the drawings.
- B. Manufacturers Qualifications: Member Steel Joist Institute.
- C. Welding Qualifications: Qualify welding processes and welders in accordance with the AWS - "Standard Qualification Procedure."

1.6 REFERENCES

- A. Steel Joist Institute (SJI.):
 - Standard Specifications and Load Tables - Open Web Steel Joists
 - Short Span Steel Joists - K Series
 - Long Span Steel Joists - LH Series
- B. American Institute of Steel Construction (AISC): "Manual of Steel Construction", 14th Edition.
- C. American Iron and Steel Institute (AISI): Specification for the Design of Cold-Formed Steel Structural Members.
- D. Steel Structures Painting Council (SSPC): Steel Structures Painting Manual, Volume 1 and Volume 2, Systems and Specifications, by Steel Structures Painting Council.
- E. American Welding Society (AWS): D1.1 Structural Welding Code Standard Qualification Procedures

1.7 SUBMITTALS

- A. Shop Drawings: Show layout of joist units, special connections, jointing and accessories. Include the mark, number, type, location and spacing of joists and bridging. **Please note that the Contract Documents in CADD format will not be made available to the construction manager for their use in the preparation of the shop drawings, unless a release is signed.**
- B. Certification: That joists comply with "AISC-SJI. Specifications".
- C. Product Data: Specifications and installation instructions for each type of joist and its accessories.
- C. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating location of extraction, manufacture, purchase of primary raw materials. Include material cost value.

1.8 DELIVERY, STORAGE HANDLING

- A. Product Handling: As recommended in "AISC-SJI. Specifications". Handling and storage: Prevent deformation of members and excessive stresses.

PART 2 – PRODUCTS

2.0 LEED REQUIREMENTS

- A. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:
 - 1. Plate and Bar: Minimum 30 percent total recycled content.
 - 2. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - 3. Steel Pipe: Minimum 30 percent total recycled content.
 - 4. All other Steel Materials: Minimum 30 percent total recycled content.

- B. Regional Materials: Provide minimum 25 percent of steel manufactured and of primary raw materials extracted or recovered within 100 mile radius of Project Site.

2.1 MATERIALS

- A. Steel: Comply with "AISC-SJI. Specifications:

- B. Threaded Fasteners:

1. ASTM A-325 heavy hexagon structural bolts with nuts and hardened washers.

- C. Prime Paint: AISC-SJI. Specifications, Type I Grey oxide; Type II Asphaltic not permitted.

1. Manufacturers:

- Tnemec Company – Series 88HS Azero HS Primer
- Or approved equal

2.2 SHORT SPAN STEEL JOISTS (K SERIES)

- A. Design and fabricate in accordance with "AISC SJI. Standard Specifications and Load Tables for Short Span Steel Joists, K-Series."

- B. Bearing Ends: Extend a minimum distance of 2-1/2 inches on steel supports, and a minimum of 4 inches on masonry and concrete supports.

2.3 LONG SPAN STEEL JOIST (LH & DLH SERIES)

- A. Design and fabricate in accordance with "AISC SJI. Standard Specifications and Load Tables for Long Span Steel Joist, LH & DLH Series."

- B. Bearing Ends: Extend a minimum distance of 4 inches on steel supports, and a minimum of 6 inches on masonry and concrete supports.

2.4 FABRICATION

- A. General: Fabricate in accordance with "AISC-SJI. Specifications."

1. Camber: Fabricate joists with camber as noted or indicated on drawings.

- B. Extended Ends: Provide top chord extended ends on joists; design to support uniform loads indicated in "SJI. Specifications and Load Tables."

1. Design as cantilever beams with reactions carried back to not less than the first panel point of the joists.
2. Cantilevered extended ends shall be designed for a maximum live load deflection of the cantilevered length divided by 240 ($L_c/240$).

- C. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord.

1. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards.
2. Sufficient strength to support the ceiling construction within deflection limit indicated.
3. Extend ends to within 1" of the finished wall surface, unless otherwise indicated.

- D. End Anchorage and Bearing Plates: Provide end anchorages to secure joists to adjacent construction, comply with "AISC-SJI. Specifications" except as indicated.
 - 1. Include beveled end bearings for installations where slope exceeds 1/4 inch (6.35 mm) in 12 inches (304.8 mm).
- E. Header Units: Provide header units to support tail joists at openings in floor or roof system.
- F. Bridging and Sag Rods: Provide bridging, sag rods and anchors for ends of lines, terminate at walls or beams.
- G. Shop Painting: Shop paint all steel joists and joist girders except members or portion of members to be embedded in concrete or sprayed on fireproofing. Paint embedded steel on exposed portions and initial 2 inches of embedded areas only.
 - 1. Remove loose scale, heavy rust, and other foreign materials from joists and accessories before application of shop paint in accordance with SSPC SP-2 "Hand Tool Cleaning" and SP-3 "Power Tool Cleaning."
 - 2. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning."
 - 3. Apply one shop coat of rust inhibitive prime paint to steel joists and accessories, by spray, dipping, or other method.
 - 4. Provide continuous minimum dry film thickness of not less than 1.0 mils.
 - 5. Another coat shall be applied, at the time of erection, if the original protection has deteriorated in any manner.
 - 6. Install finish paint to all surfaces of joist prior to erection per spec section 051200, paragraph 2.1.L.2 and 2.3.C.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Erector must examine the areas and conditions under which steel joists are to be installed and provide notification in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 ERECTION

- A. Placing Joists: Place and secure steel joist in accordance with "AISC-SJI. Specifications" and as herein specified. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
 - 1. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
 - 2. Do not place construction loads upon joists, until joists and bridging are securely in place.
 - 3. Maximum spacing of joists is shown in plans on the structural drawings. Joists shall be spaced less than maximum distance shown in plans where it is necessary to avoid pipes, openings, parallel partitions, etc.
 - 4. Set joists accurately, in proper locations. Alignment of each joist in place shall not deviate more than 3/8" in 10 feet from a straight line.
 - 5. Bearing surfaces of the joists shall be in the same plane with full bearing on supports and anchored as indicated. For joist ends bearing on masonry, provide solid level bearing of 8" minimum depth filled with concrete.
 - 6. Strut joists at columns shall have top chords bolted to structural members and the bottom

chords shall be extended. The top chords shall be welded to structural members after field adjustments. See structural details.

B. Attachment:

1. Welding: Field weld joists to supporting steel frame work in accordance with AISC-SJI. Specifications for the type of joists used. Coordinate welding sequence and procedure with the placing of joists.
2. Anchors: Furnish anchor bolts and other devices to be built into concrete and masonry construction. Furnish templates for accurate location of anchors to other work. Hook anchors not permitted.

C. Bridging:

1. Install bridging immediately after joists are erected. Brace end joists laterally by anchors or ties at each line of bridging.
2. Type as noted or detailed on structural drawings. Bridge both bottom and top chords. Weld all bridging.
 - a) Install parallel bridging for short span joist and promptly after placing joist.
 - a) Where 4 or 5 rows of bridging are required, a row nearest the midspan of the joist shall be diagonal bridging with bolted connections at chords and intersections.
3. Interruption of bridging: (e.g. ducts, suspended HVAC units, recessed light fixtures, etc.) Provide bridging at each end of such items that will overlap line of standard bridging.
4. Joists to be exposed in finished areas: Erect bridging in line with all sections straight, neatly installed and coordinated with building features.

3.3 PROTECTION

- A. Distribute all construction loads so that carrying capacity of each joist is not exceeded.
- B. Joists shall not be moved or cut, after permanently set, except under written direction of the Architect.

3.4 DEFECTIVE WORK

- A. Joists with bent chords or web members, poor welds or other defects, will be rejected and must be replaced with material meeting these specifications.

3.5 TOUCH-UP PAINTING

- A. After joist installation, paint all field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members per spec section 051200, paragraph 3.2.H. Wire brush surfaces and clean with solvent before painting. Use the same type of paint as used for shop painting.

3.6 INSPECTION AND TESTING

- A. General: Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of the steel joists for testing purposes will be borne by the Owner if welds are found to be satisfactory. Expense of removal and replacement of any work found to be defective, with new acceptable work, is the contractor's responsibility.
 1. The Owner shall employ and pay for an inspection agency approved by the Architect to inspect the joist.
 2. Documents: Provide the inspection agency with a complete set of Contract Documents and approved shop drawings before the work is started.

3. Notification: The contractor shall notify the inspection agency before the start of erection of steel joists in order that the inspector may properly schedule the required inspections.

B. Mill Test Reports:

1. Furnish the inspection agency a copy of the certified mill test reports of chemical analysis and physical test for each heat number of structural steel.
2. Furnish an affidavit (six copies) from steel manufacturer, stating that steel furnished for the project complies with the specifications.

C. Shop Inspection includes:

1. General inspection of the joist fabrication, including welding and required camber.
2. Shop inspection shall be made in the field prior to erection of joist.
3. Mill Certificates shall be reviewed and approved by the inspection agency prior to fabrication.

D. Field Inspection includes:

1. Setting of bearing plates when required.
2. Field welding of joists to supports.
3. Bridging installation and materials.
4. Anchorage requirements called for on the drawings.
5. Alignment of adjacent joists.
6. Field touch-up of paint and painting of field welds prior to placement of deck.

E. Written Certification:

1. Upon completion of the installation of all steel joists, the inspection agency shall submit written certification that the joists as manufactured meet all the requirements of the Contract Documents.

3.7 CONTRACTOR'S RESPONSIBILITY

- A. Acceptance of the shop and field inspection done by the testing agency pertaining to the structural steel, does not relieve the contractor of his responsibility to ensure that the project has the proper sizes, strength, fabrication and erection procedures and any other requirements of the Contract Documents.
- B. Submit copies of all reports indicating conformance and exceptions to contract documents in a timely fashion to contractor for distribution to design consultants, owner, subcontractors and other interested parties.
- C. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 05 21 00

SECTION 05 31 14
STEEL FLOOR CENTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SECTION INCLUDES

- A. Metal Centering for floor construction.

1.3 QUALITY ASSURANCE

- A. Erector/Installer's Qualifications: Experienced in the installation and/or erection of metal centering and accessories; approved for the installation of the centering by the manufacturer of the centering.
- B. Qualification of welding:
 - 1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
- C. Product Compatibility: Products indicated as part of a specific assembly shall be certified by each manufacturer to be compatible with the other products proposed for use by the Construction Manager in that assembly.
- D. Referenced Standards: The following publications of the issues listed below, but referred to hereinafter by basic designation only, form a part of this specification.

1.4 REFERENCES

- A. Steel Deck Institute (SDI).
- B. American Iron and Steel Institute (AISI): "Specifications for Design of Light Gauge Cold-Formed Steel Structural Members"
- C. American Society for Testing and Materials (ASTM).
 - A446-75 - Specification for Steel Sheet, Zinc-Coated (Galvanized by the Hot-Dip Process, Structural (Physical) Quality.
 - A525-75 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
 - A611-72 - Specification for Steel, Cold-Rolled Sheet, Carbon, Structural for uncoated steel.
- D. American Welding Society (AWS): Code for Welding in Building Construction.

1.5 SUBMITTALS

- A. Manufacturer's Data, Metal Floor Decking:
 - 1. For information only, submit two copies of manufacturer's specifications and installation instructions for each product specified. Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a

copy of each instruction has been distributed to the installer.

- B. Shop Drawings: Show complete erection layouts, connection details, welds, and anchorages. Indicate framing and support locations, dimensions and marking of decking sections to correspond with installation sequence and procedure; show connections with adjoining construction and materials, types of welds and locations of all hole and/or openings in centering.
- C. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating location of extraction, manufacture, purchase of primary raw materials. Include material cost value.

PART 2 - PRODUCTS

2.0 LEED REQUIREMENTS

- A. Recycled Content: Provide steel at least 50 percent post-consumer recycled content.
- B. Regional Materials: Provide minimum 25 percent of steel manufactured and of primary raw materials extracted or recovered within 100 mile radius of Project Site.

2.1 MATERIALS

- A. The metal centering floor deck units and all flashings shall be formed from steel sheets conforming to ASTM A-446, Grade A for galvanized sheets and ASTM A-611, Grade C for uncoated sheets.
- B. The steel shall have received, before being formed, a metal protective coating of zinc conforming to ASTM A-525 T wiped coating, Designation G60, and to Federal Specifications QQ-S-775C, Type 1, Class E.
- C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with ASTM A780-80.
- D. Wing Washers as manufactured by the United Steel Deck or approved equal.

2.2 PERFORMANCE REQUIREMENTS

- A. Properties of Sections: Compute the properties of metal floor deck sections on the basis of the effective design width as limited by the provisions of the AISI Specifications, Section 2.3.1 and 2.3.5. Provide not less than the deck section properties shown, including section modulus and moment of inertia per foot of width.
- B. Design Criteria:
 - 1. Allowable Deflection: Design and fabricate deck for maximum deflection of 1/360 of the clear span under the total uniform super-imposed and live load.
 - 2. Reports of test conducted as set forth by AISI Specifications may be submitted in lieu of calculations of strength, safe load carrying capacity, deflection or other properties.
 - 3. Composite floor unit (combined steel and concrete sections) shall be capable of supporting

concentrated loadings plus 50% impact factor. Where more than 1' width of composite section is required to carry this loading, the lateral distribution characteristics must be demonstrated by full scale simple span load tests, or by rational analysis associated with subject tests.

2.3 FABRICATION

A. Metal centering floor deck units:

1. Form centering units in lengths to span 3 or more support spacings, with nested side laps and end laps.
2. Centering shall be 9/16 inch x 28 gauge galvanized slabform type "0.6C28" as manufactured by Vulcraft Steel Deck or approved equal.

B. Metal closure strips:

1. Fabricate metal closure strips for openings between floor centering and other construction, of sheet steel of the quality as the deck units. Form to the configuration required to provide tight fitting closures at open ends of cells or flutes and sides of the floor centering. Fabricate 16 gauge screed angles as shown on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- #### A.
- Examine the areas and conditions under which metal centering is to be installed and provide written notification of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

- #### A. General:
- Install centering and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein. Place centering on supporting steel framework and adjust to final position with ends accurately aligned and 2" minimum bearing on supporting members before being permanently fastened. Place deck units flat and square and provide solid level bearing at steel supports and secured to adjacent framing without warp or excessive deflection. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

1. Do not use centering for storage or working platforms until permanently secured in position.

B. Fastening deck units:

1. Fasten deck units to steel supporting members by not less than 5/8" diameter fusion welds, spaced not more than 12" o.c. at supports. Comply with AWS requirements and procedures for manual shielded metal arc welding, the appearance and quality of welds, and the methods used in correcting welding work. Use welding washers. Weld side laps of adjacent deck units between supports, at intervals not exceeding 24" o.c.
2. Fasten deck units to light gauge framing with No. 12 tek-screws @ 8" o.c. at all supports. Attach side laps of adjacent deck units between supports at intervals not exceeding @24" o.c.

- #### C. Cutting and fitting:
- Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown on the drawings.

- D. Reinforcement at openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown. Reinforce decking around openings 6" to 12" in size by means of flat galvanized steel sheet placed over opening on top of centering and fusion welded to surface of deck. Provide 18 gauge steel sheet of same quality as deck units at least 12" wider and longer than opening. Space welds at each corner at not more than 12" o.c. along each side.
- E. Closure strips: Provide metal closure strips at all open uncovered ends and edges of decking, and in the voids between decking and other construction. Weld into position to provide a complete decking installation. Weld screed angles to spandrel beams for complete perimeter forming.
- F. Touch-up painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on the top and bottom surfaces of decking units and supporting steel members. Touch-up galvanized surfaces with the same type of shop paint used on adjacent surfaces per ASTM A780-80. Touch-up painted surfaces with the same type of shop paint used on adjacent surfaces. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into the adjacent surfaces.

3.3 INSPECTION

- A. All inspections and test shall meet the requirements of IBC 2012, Chapter 17, Sections 1701 thru 1706.
- B. The Owner shall employ an inspection agency approved by the engineer to inspect the field welding of the metal to the supporting structure. The cost of all the tests and inspections are to be borne by the Owner.
- C. Acceptance of the shop and field inspection done by the testing agency pertaining to the structural steel, does not relieve the Construction Manager of his responsibility to insure that the project has the proper sizes, strength, fabrication and erection procedures and any other requirements of the Contract Documents.

3.4 CONTRACTOR'S RESPONSIBILITY

- A. Submit copies of all reports indicating conformance and exceptions to contract documents in a timely fashion to Construction Manager for distribution to design consultants, owner, subcontractors and other interested parties.
- B. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 05 31 14

SECTION 05 31 23
STEEL ROOF DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SECTION INCLUDES

- A. Metal Decking for roof construction.

1.3 RELATED WORK

- A. Section 05 12 00 Structural Steel Framing
- B. Section 05 21 00 Steel Joist Framing
- C. Section 05 40 00 Cold-Formed Metal Framing

1.4 QUALITY ASSURANCE

- A. Erector/Installer's Qualifications: Experienced in the installation and/or erection of metal decking and accessories; approved for the installation of the decking by the manufacturer of the decking.
- B. Product compatibility: Products indicated as part of a specific assembly shall be certified by each manufacturer to be compatible with the other products proposed for use by the Contractor in that assembly. Specific areas requiring certified compatibility are composite action, and built-up roof assemblies.
- C. Wind Uplift: All roof deck shall be designed and anchored to resist a net wind uplift of 65 psf for all roof overhang areas, 43 psf for a 12'-0" width around the entire building perimeter, and 23 psf for all other roof areas.

1.5 REFERENCES

- A. Steel Deck Institute (SDI):
 - "Steel Roof Deck Design Manual."
- B. American Iron and Steel Institute (AISI):
 - AISI-02 - "Specifications for Design of Light Gauge Cold-Formed Steel Structural Members."
- C. American Welding Society:
 - (AWS) D1.3 - "Structural Welding Code-Sheet Steel"
- D. ASTM – American Society for Testing & Inspection
 - A-653 - "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated Galvannealed) by the Hot-Dip Process.
 - A-780 – "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip

- Galvanized Coatings”
- A-924 – “Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process”

1.6 SUBMITTALS

- A. Shop Drawings: Show complete erection layouts, connection details, welds, and anchorages. Indicate framing and support locations, dimensions and marking of decking sections to correspond with installation sequence and procedure; show connections with adjoining construction and materials, types of welds and locations of all holes and/or openings in decking.
- B. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating location of extraction, manufacture, purchase of primary raw materials. Include material cost value.

PART 2 - PRODUCTS

2.0 LEED REQUIREMENTS

- A. Recycled Content: Provide steel at least 50 percent post-consumer recycled content.
- B. Regional Materials: Provide minimum 25 percent of steel manufactured and of primary raw materials extracted or recovered within 100 mile radius of Project Site.

2.1 MATERIALS

- A. Steel for galvanized metal deck units: ASTM A-653, Structural Quality, Grade 33.
- B. Sheet metal accessories: ASTM A-653, commercial quality, galvanized.
- C. Galvanizing: ASTM A-924, Designation G90.
- D. Galvanizing repair paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with ASTM A-780.

2.2 FABRICATION

- A. General: Form deck units in lengths to span three or more supports, with flush, telescoped or nested side laps, unless otherwise indicated.
- B. Roof deck units: Provide deck configurations complying with SDI "Basic Design Specifications," of the gauge, depth and width shown.
 - 1. Roof deck shall be 1-1/2" x 22 gauge type "B" deck by Vulcraft or approved equal.
 - 2. Roof deck shall be 1-1/2" x 22/22 gauge type "BA" deck by Vulcraft or approved equal.
 - 3. Roof deck shall be 3" x 20 gauge type "N" by Vulcraft or approved equal.
 - 4. Roof deck shall be 3" x 20/20 gauge type "NCAS" by United Steel Deck.

- C. Metal cover plates: Fabricate metal cover plates for end-abutting deck units of not less than 18 gauge sheet steel. Form to match contour of deck units and approximately 6" wide.
- D. Metal closure strips: Fabricate metal closure strips, for openings between decking and other construction, of not less than 18 gauge sheet steel. Form to provide tight-fitting closures at open ends of flute and sides of decking.
- E. Roof sump pans: Fabricate from single piece of 14 gauge galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1 1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine the areas and conditions under which metal decking is to be installed and provide written notification of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- B. Fastening deck units:
 - 1. Fasten 1 1/2" roof deck units to steel supporting members by not less than 5/8" diameter fusion welds, spaced not more than 6" o.c. for a 15'-6" width around the entire building perimeter, and 12" o.c. for all other roof areas, with additional welds as required for diaphragm strength as shown in the contract documents. Fasten 3" roof deck units to steel supporting members by not less than 3/4" diameter fusion welds, spaced not more than 8" o.c. with additional welds as required for diaphragm strength as shown in the contract documents. Comply with AWS requirements and procedures for manual shielded metal arc welding, the appearance and quality of welds, and the methods used in correcting welding work.
 - 2. Lock side laps of adjacent deck units between supports, at intervals not exceeding 24" o.c., with additional screws as required for diaphragm strength as shown in the contract documents.
- C. Cutting and fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown on the drawings.
- D. Reinforcement at openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown. Reinforce decking around openings less than 72 square inches in size by means of flat galvanized steel sheet placed over opening on top of decking and fusion welded to surface of deck. Provide 14 gauge steel sheet of same quality as deck units at least 12" wider and longer than

opening. Space welds at each corner and not more than 12" o.c. along each side. Openings greater than 72 square inches shall be supported by steel angle frames as shown on the structural drawings.

- E. Install 6" minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Puddle weld 12" on center maximum.
- F. Hanger slots or clips: Provide approved punched hanger slots between flutes of lower element where deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures. Hanger clips designed to clip over male side joints of deck units may be used instead of hanger slots. Locate slots or clips at not more than 24" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown. Provide manufacturer's standard hanger attachment devices. Location: at suspended ceilings.
- G. Roof sump pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" o.c. with at least one weld at each corner. Cut opening in roof sump bottom to accommodate drain size indicated.
- H. Closure strips: Provide metal closure strips at all open uncovered ends and edges of roof decking, and in the voids between decking and other construction. Weld into position to provide a complete decking installation.
- I. Touch-up painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on the top and bottom surfaces of decking units and supporting steel members. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with ASTM A-780. Touch-up painted surfaces with the same type of shop paint used on adjacent surfaces. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into the adjacent surfaces.

3.3 INSPECTION

- A. The Owner shall employ an inspection agency approved by the engineer to inspect the field welding of the metal roof decking to the supporting structure. The cost of all the tests and inspections are to be borne by the Owner.
- B. See spec section 05 12 00 for further requirements.

END OF SECTION 05 31 23

**SECTION 05 4000
COLD-FORMED METAL FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment and services necessary for and reasonably incidental to the furnishing and installation of all light gauge metal framing as shown on the drawings and/or called for in these Specifications.

1.3 SECTION INCLUDES

- A. Cold-formed light gauge framing.

1.4 RELATED WORK

- A. Section 04 05 23 Masonry Accessories, Veneer Wall Ties.
- B. Section 04 20 00 Unit Masonry, Veneer Masonry
- C. Division 5 Structural Metals
- D. Division 6 Wood
- E. Section 09 22 16 Non-Structural Metal Framing

1.5 REFERENCES

- A. Work shall meet the requirements of the following standards:
 - 1. American Iron and Steel Institute - A.I.S.I. Design of Cold Formed Steel Design Manual – 2008 Edition.
 - 2. American Welding Society (A.W.S.)
 - D.1.1 - Structural Welding Code
 - D.1.3 - Specifications for Welding Sheet in Structures
 - 3. American Society for Testing and Materials (ASTM).
 - A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Structural (Physical) Quality
 - A 924 - General Requirements for the Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - A 780 - Practice for the Repair of Damaged Hot-Dip Galvanized Coatings
 - A 766 - Electrodeposited Coatings of Cadmium
 - C 955 - Load-Bearing (Transverse and Axial) Steel Studs. Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases
 - C 1007 - Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories

4. Brick Institute of America (BIA) Technical Notes
 - 28B - Brick Veneer Panel and Curtain Walls
 5. Federal Specifications:
 - FF-P-395 - Pin, Drive, Guided and Pin Drive, Power Actuated Fasteners for Power Actuated and Hand Actuated Fastening Tools
 - FF-S-325 - Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring Masonry)
 6. American Society of Civil Engineers
 - ASCE 7-10 - Minimum Design Loads for Buildings and Other Structures
- B. The most stringent requirements shall govern in conflicts between specified codes and standards. All components and cladding shall be designed utilizing exposure "C".

1.6 DESIGN REQUIREMENTS

- A. Employ and pay for services of a registered Structural Engineer in the state of Maryland to provide engineering data required for submittals and to certify manufacturer's submitted products will meet design requirements.
- B. Design system to meet performance requirements and regulatory requirements.

1.7 PERFORMANCE REQUIREMENTS

- A. Connections (member to member and member to structure) shall be thoroughly examined and designed.
- B. Steel Studs: Steel studs shall be of a configuration and gage to provide sufficient stiffness, as controlled by the maximum allowable deflection, under full live load, dead load and wind load of L/600 when secured to masonry veneer and L/360 in all other areas.
- C. Provide additional joists, trusses, rafters, wall studs, tracks, unistrut, bracing, connections, etc. beyond that which is presently shown on the contract documents as necessary to assure the roof, MEP systems support, and exterior wall system, etc. are complete and sufficient to meet all of the requirements of the local building code and ASCE 7-10.
- D. Contractor shall provide a minimum 2 year warranty on all products and labor.

1.8 SUBMITTALS

- A. Product Data: Catalog cuts showing materials and each component's dimensions and sectional properties.
- B. Shop Drawings: Indicate member sizes and spacings. Illustrate materials, shop coatings, steel thicknesses, details of fabrication, details of attachment to adjoining work, size, location, spacing of fasteners for attaching framing to itself, details of attachment to the structure, accessories and their installation, and critical installation procedures. Drawings may include plans, elevations, sections, and details.
 1. Shop and field assembly details including cutting and connections; Type and location of welding, bolting and fastening devices.
 2. If prefabricated framing is utilized, include individual panel drawings for each condition including configuration, dimensions, materials, attachments and panel location.
 3. Provide reinforcement details for holes cut through structural studs for each product.

- C. Certification: Statement from framing manufacturer certifying that materials conform to requirements of Contract Documents.
- D. Connection Calculations: Engineering calculations shall be prepared verifying the assembly's ability to meet or exceed design requirements as required by local codes and authorities.
- E. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating location of extraction, manufacture, purchase of primary raw materials. Include material cost value.
 - 3. MR Credit: BPDO – Material Ingredients
 - a. For steel, if available: Material Ingredient Report

1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacture of products specified in this Section with minimum 3 years documented experience.
- B. Installer: Welders shall be certified under provisions of AWS for structural welding and specific qualifications for sheet steel.
- C. Design Engineer: Registered Structural Engineer and licensed in the State of Project location, and experienced in the structural design of lightgauge framing systems.

1.10 SHOP DRAWINGS

- A. The Contractor shall submit the following for review:
 - 1. Shop drawings, together with complete erection drawings, indicating all fasteners and weld types, sizes and locations.
 - 2. Calculations sealed by a Structural Engineer registered in the state of the project for all connections of the cold formed metal framing components to each other and to the building frame.
- B. Only shop drawings bearing the stamp of review of the Structural Engineers and Architects shall be used by the Contractor for fabrication and erection.
- C. Shop and Erection Drawings shall not be reprints of the Contract Drawings. They shall, in the opinion of the Architect, be complete in all details and they shall locate, size, and mark all members. Details shall clearly indicate a manner of making all typical and special connections, amount of bearing, and shall accurately indicated the member's location relative to walls, spandrel sections, openings or other construction features. Erection drawings shall include a Field Weld Schedule, and sections and details covering all field welds required for the finished structure.
- D. Figured and field dimensions only shall be used; scaling drawings not permitted. The Contractor shall verify all dimensions and be responsible for coordinating same. Any conflict shall be referred to the Architect for decision prior to proceeding with fabrication of the work affected.

- E. The review of the Shop drawings is limited to design intent only. No responsibility for a detailed check of information is assumed by the Architect by virtue of such approval.

1.11 INSPECTION AND QUALITY CONTROL

- A. Contractor shall provide effective full time quality control over all fabrication and erection activities.
- B. As directed by Architect, owner's testing agency may inspect the maintenance of a quality control program including spot checking weldments and welding procedures in accordance with A.W.S. standards.
- C. Inspection by owner's testing agency is not intended to be comprehensive or complete. Full responsibility for quality control shall remain with the Contractor.
- D. The owner shall employ an inspection agency approved by the engineer to inspect the shop and field welding and screw connections of the stud components to themselves and to the metal supporting structure. The cost of all tests and inspections are to be borne by the owner.

1.12 REGULATORY REQUIREMENTS

- A. Conform to applicable provisions of the Building Code.

1.13 DELIVERY, STORAGE AND HANDLING

- A. Protect metal framing units from rusting and damage.
- B. Deliver in manufacturer's unopened containers or bundles, color identified with metal thickness and grade of steel.
- C. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.
- D. Handle and lift components and prefabricated panels in a manner to prevent, damage, distortion, and undue stress.

PART 2 - PRODUCTS

2.0 LEED REQUIREMENTS

- A. Recycled Content: Provide steel at least 25 percent post-consumer recycled content.
- B. Regional Materials: Provide minimum 25 percent of steel manufactured and of primary raw materials extracted or recovered within 100 mile radius of Project Site.

2.1 MANUFACTURERS

- A. Lightgage metal framing
 - 1. Marino\Ware
 - 2. ClarkeDietrich Building Systems
 - 3. Camden Interior Products, Inc.
 - 4. Or approved equal

2.2 PROPERTIES

- A. The physical and structural properties listed by MARINO WARE shall be considered the minimum permitted for all lightgauge metal framing members. Specifically, the following minimum properties, calculated in accordance with the latest A.I.S.I. Specification shall be provided: Ix(in.4), Area (in.2), rx(in.), Fy(KSI), Resisting Moment (in.-lb). Follow ASTM A446-72, latest edition.
- B. All structural studs shall be configured such that the maximum web punching shall be one (1) inch diameter holes at 30 inches on center. All structural joists in lintel assemblies shall have no pre-punched holes.
- C. The physical and structural properties listed by Unistrut shall be considered the minimum permitted for all Unistrut framing members. Specifically, the following minimum properties, calculated in accordance with the latest A.I.S.I. Specification shall be provided: Ix(in.4), Area (in.2), rx(in.), Fy(KSI), Resisting Moment (in.-lb).

2.3 SUBSTITUTIONS

- A. The Architect must approve any substitutions in writing ten (10) days prior to bid date.

2.4 ACCESSORIES

- A. Provide standard steel runners (tracks), slip tracks, slide blocks, blocking, lintels, clip angles, shoes, reinforcements, and accessories.
- B. Accessories shall be as recommended by framing manufacturer for applications indicated and as required to provide complete and substantial framing system.

2.5 FASTENERS

- A. Fasteners shall be of sufficient size to ensure strength of connection. Minimum edge distance shall be 1/2" for all screws and pins and 1" for all bolts.
- B. Steel Drill Screws: Screws shall have rust inhibitive coating (cadmium or zinc plating, ASTM B 766) suitable for the installation in which they are being used.
- C. Power Actuated Drive Pins: In accordance with FF-P-395.
- D. Expansion Bolts: In accordance with FF-S-325, except lead, fiber, and plastic shields are not permitted.

2.6 FINISH TOUCH-UP

- A. Zinc Rich Paint: In accordance with ASTM A 780.
- B. Prime Paint: Similar to that used by framing manufacturer.

2.7 FABRICATION

- A. Framing components may be prefabricated into panels for erection. Fabricate panels plumb, square, true to line and braced against racking.
- B. With each type of metal framing required, provide standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories recommended by the manufacturer and as shown on drawings for applications indicated and required to provide a

complete and substantial metal framing system.

- C. Cut all framing components squarely or at an angle to fit squarely against abutting members. Hold members firmly in position until properly fastened. Wire tying of framing components in structural applications is not permitted. Torch cutting of load bearing studs is not permitted. Slicing of load bearing members is not permitted.
- D. Perform shop and field welding in accordance with AWS D1.1, AWS D1.3, and AISI Manual Section 4.2.
- E. Provide insulation equal to that specified elsewhere in all double jamb studs and double header members which will not be accessible to the insulation Contractor. After fabrication and installation.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Inspection: Prior to installation, inspect work of all other trades. Verify that all such work is complete and accurate to the point where this installation may properly commence in strict accordance with the contract documents and approved framing shop drawings.

3.2 DISCREPANCIES

- A. Immediately notify Architect of all discrepancies.
- B. Do not proceed with installation in areas of discrepancies until such discrepancy has been fully resolved.

3.4 TOLERANCES

- A. Vertical alignment (plumbness) of studs shall be within 1/960 (1/8 inch in 10 ft.) of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960 (1/8 inch in 10 ft.) of their respective lengths.
- C. Spacing of the studs shall be more than 1/8 inch from the designed spacing, provided that the cumulative error does not exceed the requirements of the finishing material.
- D. Squareness of the prefabricated panels shall be not more than 1/8 inch out of square within the length of that panel.

3.5 INSPECTION

- A. Comply with inspection requirements of Section 01 4000, Quality Control Services.
- B. Inspect fabrication and installation for compliance with ASTM C 1007.
- C. Review Contractor quality control program.
- D. Inspect shop and field welding of cold-formed metal framing components to each other and to structural metal framing, including compliance with AWS standards.
- E. These inspections shall include wall and truss plumbness, bridging & bracing, roof deck &

drywall attachment, and other system components.

3.6 ADJUSTMENTS

- A. Finish Touch-Up: After installation, wire brush and clean scarred areas, welds, rust spots and other steel bared by fabrication and erection procedures.
- B. Touch-up surfaces using zinc rich paint on galvanized steel and paint equal to that used by the manufacturer on painted steel members.
- C. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.7 PROTECTION OF INSTALLED WORK

- A. Do not apply loads until bridging, bracing, strapping, and web reinforcement are securely in place.
- B. Do not overload the floor system during construction. Prevent concentrated floor or roof loads, such as stacking of heavy building materials, unless adequate additional means for carrying these loads are provided.
- C. If diaphragm rated components are used in lieu of bridging, then do not apply loading until their installation. If components on one side only, then the other flanges should be bridged with suitable bridging. Bridging may be removed or left in place when diaphragm rated components are installed.

3.8 CONTRACTOR'S RESPONSIBILITY

- A. Submit copies of all reports indicating conformance and exceptions to contract documents in a timely fashion to Contractor for distribution to design consultants, owner, subcontractors and other interested parties.
- B. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 05 40 00

**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment and services necessary for and reasonably incidental to the furnishing and installation of all miscellaneous metals as shown on the drawings and/or called for in these Specifications.

1.3 SECTION INCLUDES

- A. Rough Hardware
- B. Steel Ladders
- C. Loose bearing and leveling plates
- D. Loose steel lintels
- E. Shelf angles
- F. Steel framing and supports for overhead doors
- G. Steel framing and supports for countertops
- H. Miscellaneous metal trim
- I. Metal bollards

1.4 RELATED WORK

- A. Section 04 20 00 Unit Masonry, Veneer Masonry
- B. Division 5 Structural Metals
- C. Division 6 Wood
- D. Section 09 22 16 Non-Structural Metal Framing

1.5 REFERENCES

- A. Work shall meet the requirements of the following standards:
 - 1. AAMA 611 – Voluntary specification for Anodized Architectural Aluminum, 2012
 - 2. ASTM A36/A36M – Standard specification for Carbon Structural Steel, 2014
 - 3. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013
 - 4. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes; 2014
 - 5. ASTM B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014
 - 6. AWS D1.1/D1.1M – Structural Welding Code – Steel; 2015

1.6 SUBMITTALS

- A. Shop Drawings detailing fabrication and erection of each metal fabrication indicated on drawings and in specifications. Include plans, elevations, sections and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
 - 1. For installed products indicated to comply with design loads include structural analysis data and shop drawings signed by the qualified professional engineer responsible for their preparation.
- B. Welder certificate signed by Contractor certifying that welders comply with requirements specified under the "Qualifications" section.
- C. Qualification data for firms and persons specified in the "Qualifications" Section to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.
- D. Qualifications data for professional engineer responsible for designing fabrications indicated to comply with specific design loads.
- E. LEED Submittals: Comply with Section 018113
 - 1. MR Credit: BPDO – Environmental Product Declarations
 - a. For steel: Industry-wide or product-specific EPD.
 - 2. MR Credit: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating location of extraction, manufacture, purchase of primary raw materials. Include material cost value.
 - 3. MR Credit: BPDO – Material Ingredients
 - a. For steel, if available: Material Ingredient Report

1.7 QUALIFICATIONS

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code – Steel," AWS D1.2 "Structural Welding Code – Aluminum" and AWS D1.3 "Structural Welding Code – Sheet Steel"
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 MATERIALS - STEEL

A. Metal Surfaces, General:

1. For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
2. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
3. Recycled Content: Provide steel with minimum 30 percent total recycled content, 25 percent shall be post-consumer recycled content.
4. Regional Materials: Provide steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.
5. Domestic Origin: Consistent with the Maryland Annotated Code, Article 78A known as the "Buy American Steel" Act of the General Assembly of Maryland, Acts of 1978, provide steel manufactured in the United States of America.

B. Steel Sections: ASTM A 36/A 36M.

C. Steel Tubing: Product type (manufacturing method) and as follows:

- Cold-Formed Steel Tubing: ASTM A 500.
- Hot-Formed Steel Tubing: ASTM A 501.
 - For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

D. Plates: ASTM A 283.

E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

- Galvanized finish for exterior installations and where indicated.
- Black finish elsewhere, unless otherwise indicated.

F. Gray-Iron Castings: ASTM A 48, Class 30.

G. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

- Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.2 MATERIALS - ALUMINUM

A. General:

1. Recycled Content: Give preference to aluminum with the highest recycled content feasible.

B. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy

2.3 PAINT

A. Shop Primer for Ferrous Metal - Interior Locations, Loose Lintels, Plates, etc.: Refer to Division 9 painting specifications.

- B. Shop Finish - Exterior Fabrications (Stairs, Ladders, Frames, etc):
 - 1. Prepare galvanized surfaces as required by paint manufacturer.
 - 2. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 - 3. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 - 4. This process provides an average of 8-10 mils total coating thickness.
 - 5. Color to be selected by Architect.
- C. Shop Finish - Stair Gate Fabrication:
 - 1. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 - 2. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 - 3. This process provides an average of 8-10 mils total coating thickness.
 - 4. Color to be selected by Architect.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

24 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3.
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Material - General: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material - Exposed exterior or in contact with ground: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- H. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

25 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Construction Grout; W. R. Bonsal Co.
2. Sure-grip High Performance Grout; Dayton Superior Corp.
3. Euco N-S Grout; Euclid Chemical Co.
4. Crystex; L & M Construction Chemicals, Inc.
5. Masterflow 928 and 713; Master Builders Technologies, Inc.
6. Sealtight 588 Grout; W. R. Meadows, Inc.
7. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.

2.6 FABRICATION

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 1. Temperature Change (Range): 120 deg F.
- D. Shear and punch metals cleanly and accurately; remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- M. Fabricate items with joints tightly fitted and secured.
- N. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

- O. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.8 STEEL LADDERS

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to the rung by a proprietary process.
- G. Galvanize ladders, including brackets and fasteners, in the following locations:
 - 1. Roof Access

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Hot dip galvanize loose steel lintels located in exterior walls.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors; furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other Work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
 - 2 Exterior locations.
 - 3 Interior locations where indicated.

2.13 PIPE BOLLARDS

- A. Provide Schedule 40 black steel pipe of size and height indicated as detailed on the Drawings.
- B. Permanent Setting:
 - 1. Set posts in concrete to a depth of 3'-0"; footing diameter minimum 3 times post diameter.
 - 2. Fill posts completely with concrete and dome on top.
- C. Finish: Painted as specified in Division 9 "Exterior Painting."

2.14 FINISHES - STEEL AND IRON

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

2.15 FINISHES - ALUMINUM

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I Natural Anodized Finish (unless indicated otherwise): AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.16 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and misc. items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION

- A. Fastening in place Construction: Provide anchorage devices and fasteners where necessary for securing misc. metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting and Placement: perform cutting, drilling and fitting required for installing misc. metal fabrications. Set metal fabrication accurately in location, alignment and elevation with edges and surface level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. 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 shopping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry wood, or dissimilar metals with a heavy coat of bituminous paint.

3.4 SETTING LOOSE PLATES

- A. Clean concrete bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 1. Use non-shrink, nonmetallic grout, unless otherwise specified.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTMENTS

- A. Finish Touch-Up: After installation, wire brush and clean scarred areas, welds, rust spots and other steel bared by fabrication and erection procedures.
- B. Touch-up surfaces using zinc rich paint on galvanized steel and paint equal to that used by the manufacturer on painted steel members.
- C. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

END OF SECTION 05 50 00

SECTION 05 51 19 METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes industrial-type, straight-run stairs with steel-grating treads and railings attached to metal grating stairs.

1.2 ACTION SUBMITTALS

- A. Product Data: For metal grating stairs.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content metal: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced recycled content metal: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments.
- D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm)
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
- C. Structural Performance of Railings: Railings must withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m)
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half

of pre-consumer recycled content not less than 25 percent.

- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- E. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).
- F. Cast-Abrasive Nosings: Cast iron, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both.
- G. Tubing: ASTM A 500 (cold formed).
- H. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- I. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- J. Galvanizing: In accordance with requirements of ASTM A 123/A 123M.
 - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.3 FASTENERS

- A. Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Post-Installed Anchors: Chemical anchors 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 according to ASTM E 488, conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
- C. Fabricate joints that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Industrial Class, unless

more stringent requirements are indicated.

- B. Stair Framing:
 - 1. Fabricate stringers of steel channels.
 - a. Provide closures for exposed ends of channel stringers.
 - 2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
 - 1. Fabricate treads and platforms from pressure-locked steel grating with openings in gratings no more than 5/16 inch (8 mm) in least dimension.
 - 2. Surface: Plain.
 - 3. Finish: Galvanized.
 - 4. Fabricate grating treads with cast-abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

2.7 STAIR RAILINGS

- A. Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion. Repair galvanize finish for railings.
- B. Form changes in direction as follows:
 - 1. By bending.
- C. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- D. Close exposed ends of railing members with prefabricated end fittings.
- E. Finish: Galvanized.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

- END OF SECTION 05 51 19 -

**SECTION 05 52 13
PIPE AND TUBE RAILINGS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.
- C. Section 09 29 00 - Gypsum Board Assemblies: Placement of backing plates in stud

1.3 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2016.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- D. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2015.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- G. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2007.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures, for administrative requirements.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Non-welded field connections in aluminum handrails to be limited to greatest fabricated section lengths; locations accepted by Architect and consistent for multiple locations.
- C. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content metal: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced recycled content metal: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.5 QUALITY ASSURANCE

- A. Mock-up: Build mock-up section of guardrail with attached handrail to demonstrate aesthetic effects and set quality standards for fabrication and erection.
 - 1. Size: 42 inches high x 48 inches

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Design railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.
- C. Allow for expansion and contraction of members and building movement without damage to connections or members.
- D. Dimensions: See drawings for configurations and heights.
 - 1. Infill: Round vertical pickets; size and spacing indicated on drawings.
- E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 - 3. For anchorage to stud walls, provide backing plates, for bolting anchors.
- F. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.2 STAINLESS STEEL RAILING SYSTEM

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
- E. Bars and Shapes: ASTM A 276, Type 304.

2.3 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.4 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Close exposed ends of railing members with prefabricated end fittings.
- E. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
 2. Wall brackets for aluminum railing may be cast aluminum or stainless steel; wall brackets for aluminum rails connecting to steel guardrail systems must be stainless steel and also used for wall-mounted handrails in same area.
- G. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- H. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- I. Welded Joints:
1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 2. Interior Components: Continuously seal joined pieces by continuous welds.
 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 4. Select proper welding method to result in consistent finish with final finish.
- J. Stainless Steel Handrail Field Joints:
1. Fabricate sleeves for tight press fit; keep sleeves round.
 2. Cut handrail ends square and to accurate length to assure smooth, tight joints.
 3. Fasteners: Type 304 stainless-steel tamper-resistant flat head fasteners.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Handrail Field Joints:
1. Clean area to be joined thoroughly.
 2. Apply epoxy adhesive to inside of pipe.
 3. Insert sleeve and fit components together, wipe excessive adhesive.
 4. Provide stainless steel set screws concealed on underside of handrail; fill head with epoxy setting adhesive and clean excess.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

- END OF SECTION 05 52 13 -

SECTION 06 10 53
MISCELLANEOUS ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Requirements of the General Conditions, Supplementary Conditions and Division 1 of these specifications apply to this Section.
- B. Include all labor, materials, appliances and services necessary to complete all rough carpentry and related work required by the drawings and/or described in this specification.
- C. Generally: Concealed or temporary wood work; rough and general carpentry duties; necessary wood framing, blocking, sheathing, finishing, trimming and working of wood or wood fibered materials; all rough carpentry, preparatory work, bracing, propping, protection and boxing, all wood framing, grounds, bucks, wood blocking, furring, and all other general carpentry work. All wood plates as shown on the drawings. All wood blocking required by job conditions.
- D. Concealed wood blocking for support of toilet accessories, wall cabinets and wood trim.
- E. Telephone and electrical panel boards.
- F. Preservative treatment of wood.

1.2 RELATED SECTIONS

- A. Section 01 74 19: Construction Waste Management and Disposal
- B. Section 01 81 13: Sustainable Design Requirements
- C. Section 07 51 13: Built-up Asphalt Roofing
- D. Section 07 62 00: Sheet Metal Flashing and Trim
- E. Section 07 71 00: Roof Specialties
- F. Section 07 72 00: Roof Accessories
- G. Section 10 11 00: Visual Display Units
- H. Section 10 12 00: Display Cases
- I. Section 10 28 00: Toilet, Bath, and Laundry Accessories
- J. Section 12 32 16: Manufactured Plastic-Laminate Clad Casework
- K. Section 12 35 50: Media Center Casework

1.3 REFERENCES

- A. ALSC: American Lumber Standards Committee - Softwood Lumber Standards.
- B. APA: American Plywood Association.
- C. AWWPA (American Wood Protection Association): C1 – All Timber Products Preservative Treatment by Pressure Process.

- D. FSC: Forest Stewardship Council
- E. NFPA: National Forest Products Association.
- F. SPID Southern Pine Inspection Bureau.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide list of lumber grades and sizes proposed for use and technical data on panel products.
- C. Product Data: Provide technical data on wood preservative materials and application instructions.
- D. Submittals Required for LEED Certification – MR Credit 3: BPDO – Sourcing of Raw Materials:
 - 1. For products having recycled content, provide documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating material cost for each product having recycled content.
 - 2. Submit invoices and documentation showing manufacturing locations and origins of component materials for products that have been manufactured within a 100-mile radius of the project site. Where product is made up of multiple components, indicate the extraction, harvest, or recovery location of each component and the weight of each component. Include statement indicating material cost for each regionally manufactured product.
 - 3. Submit invoices and documentation showing FSC certified wood.
- E. Submittals Required for LEED Certification – MR Credit 4: BPDO – Material Ingredients – For treated wood, if available: Material Ingredient Report.
- F. Submittals Required for LEED Certification – EQ Credit 2: Low-Emitting Materials: Provide a cut sheet or other documentation for every composite wood product used, verifying compliance with the California Air Resources Board (CARB) requirements for ultra-low-emitting formaldehyde resins or no added formaldehyde resins.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following agencies:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: Certified by APA.
 - 3. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Lumber:

1. Non-Load Bearing Members: Standard Grade Douglas Fir, Western Larch, Western Hemlock (WWPA or WCLA) or #2 Dimension Southern Pine (SPIB). Wood members shall be FSC certified.
2. Blocking: No. 2 Common Grade of any WWPA or WCLA species or No. 2 Southern Pine Boards (SPIB). Blocking shall include any wood material, without regard to size or length, which is required for the secure fastening, stiffening, anchoring or hanging of any cornice, soffit, eaves, water table, cabinet, counter, or attainment of any profile shall be provided of proper strength to fully secure or support as if fully detailed or specified. Wood blocking shall be FSC certified.
3. Wood blocking or nailers on steel framing shall be bolted thereto. Wood grounds shall also be provided for securing equipment furnished under other Sections of these specifications. Provide block nailers as required for sheet metal work. Blocking adjacent to roof insulation shall be full thickness of insulation and shall finish flush with top surface.
4. Size and Shapes: Nominal sizes shown and specified refer to undressed lumber dimensions. Dress lumber 4 sides (S4S) unless otherwise shown or specified, in accordance with the requirements of the West Coast Lumber Inspection Bureau, Grading and Dressing Rules, worked to shapes and patterns shown. All lumber shall be kiln-dried to a moisture content not to exceed 19 percent.
5. All wood blocking shall be fire retardant treated. In addition, all lumber in direct contact with masonry, concrete or earth shall be preservative treated.
6. Plywood Sheathing: thickness as indicated on the drawings, fire retardant treated and/or pressure treated as indicated on the drawings and/or as required by local Codes. Product shall contain no urea formaldehyde binders. Band all exposed edges of interior plywood with solid hardwood not less than 5/8" wide by thickness of plywood. Plywood products shall be FSC certified as required to achieve minimum 50% by cost threshold.
7. Composite wood installed within the building interior: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or contain no added formaldehyde resins.

2.2 ACCESSORIES

A. Fasteners and Anchors:

1. Fasteners: Hot-dipped galvanized steel for high humidity, exterior or exposed to weather, and treated wood locations, unfinished steel elsewhere.
2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt for anchorages to steel.
3. Furnish all rough hardware, nails, spikes, bolts, screws, staples, straps, etc., that are required for proper assembly of building components and materials.

2.3 FACTORY WOOD TREATMENT

- A. Treated wood shall receive a waterborne alkaline copper quaternary (ACQ) preservative system produced by a manufacturer approved by the American Wood Preservers Association. The product shall contain no arsenic or chromium, and shall comply with all applicable AWPA Standards, ICBO ES ER-4981, and National Evaluation Report No. NER-643. For above-ground applications, the product shall have a retention rate of between 0.25 and .040 pcf. For applications in contact with the ground, the product shall have a retention rate of 0.40 pcf.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Inspect all wood and other materials.
- B. Sort out and discard damp, warped or damaged material which would not provide consistent substrates or Underwriters Label Construction as herein specified.

3.2 INSTALLATION

- A. Wood blocking shall be installed as indicated on the drawings to provide an integral component for adjacent structural or architectural materials.
 - 1. Blocking shall be erected true and with tight joints to provide a consistent substrate for surface materials, framing or roof framing. Use the longest lengths practical to minimize jointing.
- B. Install wood framing as indicated on the drawings. Wood framing shall be erected plumb and true and firmly anchored to supporting structures, as indicated on the drawings, to provide a consistently secure strong substrate for covering work. Install blocking, nailers and bridging as required for secure fastening of surface materials and to minimize the flexibility of framing components. Blocking shall be placed four (4) feet on center maximum. All framing and blocking shall be built so that sheathing or finish work joints shall fall on the center of framing or blocking.
 - 1. Set members level and plumb, in correct position.
 - 2. Place horizontal members flat, crown side up.
 - 3. Construct curb members of single pieces.
 - 4. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
 - 5. Coordinate curb installation with installation of work of other trades.
- C. All wood bucks, blocks, bolts, anchors, etc., shall be furnished and set for building into masonry walls and partitions. All temporary and permanent wood bucks and sub-bucks shall be erected, and all plates, blocking, grounds, furring, stripping, screeds, nailers, etc., shall be securely installed at proper times to suit progress of construction.
- D. Fit carpentry work to other work. Scribe and cope as required for accurate fit. Set carpentry work accurately to required levels and lines with members plumb and true and accurately cut and fitted. Shim with metal or slate for full-bearing on concrete or masonry substrates. Set true to line and level, plumb, with intersections true to required angle. Build into masonry as work progresses, cutting to fit masonry unit size involved. Anchor to formwork before concrete placement.
- E. Wood Grounds: Provide wood grounds and blocking of size and shape required for securing trim and attaching other work in place. Set grounds true to line, level or plumb and secure firmly in place. Grounds generally will be dressed square edged, pressure treated and of a thickness required for substantial anchorage and fastening to substrate and remaining flush with adjacent finish surfaces.

- END OF SECTION 06 10 53 -

SECTION 06 20 00

FINISH CARPENTRY

1.0 GENERAL

1.1 DESCRIPTION:

- A. Requirements of the General Conditions, Supplementary Conditions and Division 1 of these specifications apply to this Section.
- B. Include all labor, materials, appliances and services necessary to complete all finish carpentry and related work required by the drawings and/or described in this specification.
- C. The extent of this work is indicated on the drawings and includes all items made of finish wood and plastics including, but not limited to, the following:

Fabrication and Installation of custom casework
Interior miscellaneous trim
Exterior miscellaneous trim
Installation of finish hardware

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 08 71 00: Supply of door hardware.

1.3 RELATED SECTIONS

- A. Section 06 10 53 – Miscellaneous Rough Carpentry
- B. Section 08 14 16 - Flush Wood Doors.
- C. Section 09 90 00 - Painting: Painting and finishing of finish carpentry items.

1.4 REFERENCES

- A. ANSI A135.4 - Basic Hardboard.
- B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- C. AWI - Quality Standards.
- D. FS MMM-A-130 - Adhesive, Contact.
- E. HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.
- F. NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.
- G. NHLA (National Hardwood Lumber Association).
- H. PS 1 - Construction and Industrial Plywood.
- I. PS 20 - American Softwood Lumber Standard.

1.5 SUBMITTALS

- A. Shop Drawings: Submit detailed shop drawings, as required to show fabrications, sizes, materials, and/or proposed extent of work. Dimensions for fabricated pieces shall be coordinated and checked in the field prior to fabrication.
- B. Samples: Submit two samples of finish plywood, 8 x 8 inch in size illustrating wood grain and specified finish.
- C. Submit two samples of wood trim 12 inches long.

1.6. QUALITY ASSURANCE:

- A. Comply with provisions of the "Architectural Woodwork Quality Standards Illustrated" of the American Woodwork Institute.
- B. Fabrication of work of this Section shall be accomplished by trained tradesmen, in the employ of a cabinetry and millwork shop which has been providing and installing finish carpentry in the local area for a minimum of five (5) years.
- C. Grading and Marking: Materials shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Except for plywood and hardboard, bundle marking or certificates will be permitted in lieu of marking each individual piece.
- D. Finish nails only will be permitted for installation of trim lumber. No trim screws are permitted.

1.7 QUALIFICATIONS

- A. Fabricator: Company specializing in fabricating the products specified in this section with minimum three years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage, store under cover in well ventilated enclosure.
- B. Storage: Under cover in well ventilated enclosure; not exposed to extreme changes in temperature and humidity; not in building where damp masonry, concrete or plaster walls exist; in such a manner to prevent any warping, bending or staining.

1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.10 COORDINATION

- A. Coordinate the work with plumbing and electrical rough-in and installation of associated and adjacent components.

PART 2 PRODUCTS

2.0 MATERIALS:

- A. Reference: All products and product requirements will be the same as those for Rough Carpentry, Section 06 10 53. In addition to the above named requirements and products, the following should be added.
- B. Plywood:
 - 1.) Particleboard (to be covered with plastic laminate): 45 lb density (CS 236-66: Type 1, Grade B, Class 2) to dimensions indicated on the drawings
 - 3.) Plywood (exterior, to be finished opaque): Plain sliced birch, Medium Density Overlay, of thickness indicated on drawings, Grade 1, marine glued
- C. Trim Lumber:
 - 1.) Trim Lumber (opaque finish) for interior work: No. 2 sugar pine, Ponderosa Pine, Idaho white pine, or poplar, S4S, sizes and profiles as indicated on the drawings.
 - 2.) Trim Lumber, (opaque finish) for exterior work: No. 2 sugar pine, Ponderosa Pine, or Idaho white pine, S4S, sizes and profiles as indicated on the drawings.

2.2 MATERIALS AND CONSTRUCTION OF CASEWORK:

- A. Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets". Cabinet construction to be of the "Flush Overlay" type for Pl. Laminate Cabinets. Division 400A-S4 Stile and Rail Wood Doors, Drawer Fronts, and Wood Panels, Style "E": Flush inset with face frame for cabinets with glass doors.

2.3 PLASTIC LAMINATE COUNTERTOPS:

- A. Shall be plastic laminate covered 1 1/2" thick particle board (see above).
- B. Plastic laminate backsplashes: shall be of 3/4" particle board (see above), fabricated as per plastic laminate countertops except that splashes at countertops with sinks to be constructed with cores of exterior grade plywood.

2.4 ADHESIVE AND FASTENERS:

- A. Adhesive: FS MMM-A-130 contact adhesive. Type recommended by AWI laminate
- B. Provide glue and nails, screws, brackets, and miscellaneous connectors as required to provide solidly constructed carpentry and casework, with freely moving components.
- C. Finish nails only will be permitted for installation of trim lumber. No trim screws are permitted.
- D. Fasteners: Of size and type to suit application.

2.5 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
- D. Leave ready for finishing as specified in Section 09 90 00.

PART 3: EXECUTION

3.0 REFERENCE:

- A. All requirements for execution and workmanship of Rough Carpentry, Section 06 10 53, apply to this work, in addition to the following specifics apply.

3.1 FABRICATION:

- A. Shop assemble all finish carpentry and casework in units as large as are able to be delivered to the project site and safely installed.
- B. Apply plastic laminate to those pieces and assemblies indicated on the drawings, in compliance with the manufacturer's installation instructions.
- C. Provide scribe strips of plastic laminate or wood where carpentry and casework abut walls.
- D. Edge Banding: Band all exposed edges of plywood with solid hardwood not less than 5/8" wide by thickness of plywood. Where transparent finish occurs edge banding shall be same species as plywood veneers.
- E. Seal all concealed surfaces prior to installation.

3.2 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.3 INSTALLATION:

- A. Install all work as indicated on the drawings.
- B. Install all work true, plumb, level, straight, without distortions, and firmly anchored to floors and walls. Shim as required for tight fit. Conceal fasteners where possible. Countersink exposed fasteners with nail set or countersink bit, and fill remaining hole with wood putty to match species. Finish nails only will be permitted for installation of trim lumber. No trim screws are permitted. Use patented anchorage devices for components under loading; no wood plugs, rawl plugs or plastic shields. Use screws as appropriate to support, minimum penetration 1/3 beyond total thickness of materials being passed.
- C. Joints: All intersections coped and mitered; all splices lapped.
- D. Exposed surfaces shall, in all instances, finish free of ripples, burrs, gouges or other irregularities that will impair surface appearance. Minor indentations may be filled and sanded smooth. Arrises, corners and edges must be true and without indentations.

3.4 FINISHING:

- A. All finish woodwork must be sanded at least once to remove burrs, splinters and minor blemishes. Fill nail holes with wood putty to match wood. Sand and leave ready for applied finishes.

- END OF SECTION 06 20 00 -

SECTION 06 26 14

MINERAL PROFILE PANELING

PART 1 - GENERAL

1.1. SUMMARY

- A. Section Includes: Light weight composite mineral profile dimensional wall paneling and seam finishing materials to create a monolithic sculptured wall surface.
- B. Products Supplied but not Installed/Used under this Section: Installation kit.
- C. Related Requirements:
 - 1. Section 01 74 19 – Construction Waste Management and Disposal.
 - 2. Section 01 81 13 – Sustainable Design Requirements.
 - 3. Section 04 20 00 – Unit Masonry.
 - 4. Section 09 29 00 – Gypsum Board: Seam finishing.
 - 5. Section 09 90 00 – Painting and Coating: Sealing and painting of mineral profile panels.

1.2. REFERENCES

- A. Abbreviations and Acronyms:
 - 1. ASTM American Society for Testing and Materials.
 - 2. GA Gypsum Association.
 - 3. LEED: Leadership in Energy and Environmental Design.
 - 4. USGBC United States Green Building Council.
- B. Reference Standards:
 - 1. ASTM D 256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - 2. ASTM D 696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics between -30 C and 30 C With a Vitreous Silica Dilatometer.
 - 3. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior finish to Room Fire Growth.
 - 4. ASTM E 84 Standard Test Methods for Surface Burning Characteristics of Building Materials.
 - 5. GA-214 Recommended Levels of Gypsum Board Finish.
 - 6. US Green Building Council: LEED Green Building Rating System.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meetings:
 - 1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: Owner, Architect, Construction Manager, Installer, Finisher, and Painter.
 - 2. Review substrate conditions, requirements of related work, installation instructions, seam finishing, and painting instructions, storage and handling procedures, and protection measures.

3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.

1.4. SUBMITTALS

- A. Product Data: Each product specified.
 - B. Project List: Minimum 5 previous completed manufacturer installations or 5 installations of similar materials and complexity. Include contact name and e-mail address or telephone number for each project.
 - C. Shop Drawings: Show standard and project specific details including termination at adjacent surfaces.
 - D. Samples: Minimum 15 by 15 inch panel of specified design(s).
 - E. Manufacturer's installation instructions.
 - F. Qualification Statements: Proof of manufacturer, installer, and finisher qualifications.
 - G. LEED Submittals: Comply with Section 01 81 13.
1. EQ Credit 2: Low-Emitting Materials: For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

1.5. QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer: Minimum five years' experience in producing mineral profile paneling.
 2. Installer: Minimum three years' experience in finish carpentry/architectural woodwork installation.
 3. Finisher: Minimum three years' experience in executing Level 5 finish in accordance with GA-214.
- B. Field Samples:
 1. Provide in a location selected by Architect showing representative sample of installed product including finished seam.
 2. Minimum Size: 5 by 5 feet.
 3. Approved field samples may remain as part of completed Work.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 1. Store panels in fully enclosed space, protected against damage from moisture, direct sunlight, and surface contamination.
 2. Store panels vertically, in shipping crates, until ready to be installed. Loosen crate lids to allow for venting. Do not stack or lean against walls.
 3. Store panels in area of installation minimum 24 hours prior to installation.
- B. Packaging Waste Management: 100 percent of materials used to package components of this section shall be recyclable.

1.7. FIELD CONDITIONS

A. Ambient Conditions:

1. HVAC: Operate HVAC system to maintain occupancy level temperature and relative humidity conditions (35 to 67 percent) in the area of installation from 24 hours prior to delivery of panels to the installation area through remainder of construction period.
2. Lighting: Permanent project lighting must be operational prior to seam finishing.

1.8. WARRANTY

- A. Manufacturer Warranty: Provide manufacturer's standard limited warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Modular Arts, Inc.
- B. Interlam Corp.
- C. Koroseal Interior Products, LLC
- D. CSI Wall Panels
- E. Or approved equal

2.2 COMPONENTS

- A. Profile Panel: Smooth surface mineral composite panel with light weight plant-based foam back.

1. Size: 32 by 32 by 1.5 inch maximum profile relief.
2. Physical Properties:
 - a. Izod Impact Strength: ASTM D 256 9.4 ft-lb/in²
 - b. Thermal Expansion: ASTM D 696 3.8×10^{-7} in/in °F.
 - c. Compressive Strength: ASTM D 696 2.3 ksi.
 - d. Room Corner Burn Test: NFPA 286 Pass
 - e. Flame Spread Index: ASTM E 84 0
 - f. Smoke Development Index: ASTM E 84 50
 - g. Weight 1.5 psf
3. Designs:
 - a. Panel Type MPP #1 - Crush; no direction; color: Green (see finish schedule)
 - b. Panel Type MPP #2 – Doppler; Vertical Orientation; color: Green (see finish schedule)
 - c. Panel Type MPP #3 - Swim; horizontal orientation; color: Blue (see finish schedule)
 - d. Panel Type MPP #4 – Big Dot; no direction; color: Dark Yellow (see finish schedule)
 - e. Panel Type MPP #5 – Dakota; horizontal orientation; color: Soft Yellow (see finish schedule)

B. Installation Kit:

1. Dry Mix Joint Compound: One 18 lb bag SHEETROCK® brand EASY SAND™ 45, or BEADEX® brand SILVER SET™ 40.
2. Acrylic Fortifier: One quart THORO® ACRYL 60®.

3. Construction Adhesive: Twelve 10.2 oz tubes PL® Polyurethane Premium Construction Adhesive.
4. Primer Sealer: 3 gal GLIDDEN® GRIPPER® WHITE PRIMER/SEALER GL-3210-1200.
5. Countersink Drill Bit with Depth Stop-Collar: One No. 7.
6. Flexible Spreader: One MUDTOOLS SMT-Y2
7. Sandpaper: 15 sheets No-Load 220G, 10 sheets No-Load 150G.
8. Plastic Container: One 100 oz.
9. Measuring Cup: One 8 oz.

2.3 ACCESSORIES

- A. At CMU walls; mount 1" x 4" wood stringers to wall with lag bolts. Screw panels directly to stringers.
- B. Screws: Coarse thread, CMU type, length as required by panel design and in accordance with Manufacturer's Installation Instructions.

2.4 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:

1. Dimensions, length and width: $\pm 1/16$ inch.
2. Thickness: $\pm 1/16$ inch.
3. Weight: $\pm 1/2$ lb.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which profile paneling will be installed.
 1. Verify that substrate is a material listed as an acceptable substrate by the profile paneling manufacturer.
- B. Verify that permanent project lighting is in place and operational prior to start of seam finishing.
- C. Coordinate with responsible entity to correct unsatisfactory conditions.
- D. Commencement of work by installer is acceptance of substrate conditions.

3.2 INSTALLATION

- A. Install profile paneling in accordance with Manufacturer's Installation Instructions. Seam finishing shall be performed under Section 09 29 00 – Gypsum Board, and sealing and painting shall be performed under Section 09 90 00 – Painting and Coating.

3.3 CLEANING AND DISPOSAL

- A. Waste Management: Refer to Section 01 74 19 – Construction Waste Management and Disposal.
- B. Cleaning: Refer to Section 01 77 00 – Closeout Procedures.

3.4 PROTECTION

- A. Protect finished work from damage during remainder of construction period.

- END OF SECTION 06 26 14 -

**SECTION 07 11 13
BITUMINOUS DAMPPROOFING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.
- B. Related Requirements:
 - 1. Section 04 20 00 "Unit Masonry" for mortar parge coat on masonry surfaces.
 - 2. Section 07 13 26 "Self-Adhering Sheet Waterproofing" for waterproofing.

1.3 ACTION SUBMITTALS

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

1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

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

2.3 ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BASF Corporation; Construction Systems.
 - 2. Euclid Chemical Company (The); an RPM company.
 - 3. Henry Company.
 - 4. Karnak Corporation.
 - 5. W. R. Meadows, Inc.
- B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.4 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water, as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- D. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- E. Protection Course: Smooth-surfaced roll roofing complying with ASTM D 6380, Class S, Type III.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling, unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer, or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches (150 mm) over outside face of footing.
 - 1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations and Parged Masonry Foundation Walls: Apply two (2) brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.
- B. Unparged Masonry Foundation Walls: Apply primer and two (2) brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.
- C. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one (1) brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).
 - 1. Locations: Exterior screen walls and landscape walls only.

3.5 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
2. Install protection course within twenty-four (24) hours of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.6 PROTECTION

- A. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION 07 11 13

SECTION 07 13 26
SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Modified bituminous sheet waterproofing.
 - 2. Blindsight sheet waterproofing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. LEED Submittals: Comply with 01 81 13.
 - 1. MR Credit 4: BPDO – Material Ingredients.
 - a. For waterproofing, if available: Material Ingredient Report.
- C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
 - 1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- D. Samples: For each exposed product and for each color and texture specified, including the following products:
 - 1. 8-by-8-inch (200-by-200-mm) square of waterproofing and flashing sheet.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials and protection course from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side.
 - 1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
 - b. GCP Applied Technologies Inc.; Bituthene 4000.
 - c. Polyguard Products, Inc.; Polyguard 650 Membrane.
 - d. W.R. Meadows, Inc; Mel-Rol.
 - 2. Physical Properties:
 - a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970/D 1970M.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836/C 836M.
 - e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154/E 154M.
 - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
 - g. Water Vapor Permeance: 0.05 perm (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
 - h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 BLINDSIDE SHEET WATERPROOFING

- A. Blindside Sheet Waterproofing for Vertical Applications: Uniform, flexible, multilayered-composite sheet membrane that forms a permanent bond with fresh concrete placed against it; complete with accessories and preformed shapes for an unbroken waterproofing assembly; with the following physical properties:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc; MiraPLY-V.
 - b. GCP Applied Technologies Inc.; Preprufe 160R-Plus.
 - c. Polyguard Products, Inc.; Polyguard Underseal Blindside Membrane.
 - d. W.R. Meadows, Inc; PRECON.
2. Physical Properties:
 - a. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D1970/D1970M.
 - b. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D903, modified.
 - c. Lap Adhesion: 5 lbf/in. (875 N/m) minimum; ASTM D1876, modified.
 - d. Hydrostatic-Head Resistance: 230 feet (70 m); ASTM D5385, modified.
 - e. Puncture Resistance: 100 lbf (445 N) minimum; ASTM E154/E154M.
 - f. Water Vapor Permeance: 0.1 perm (6 ng/Pa x s x sq. m) maximum; ASTM E96/E96M, Water Method.
 - g. Ultimate Elongation: 335 percent minimum; ASTM D412, modified.

- B. Blindside Sheet Waterproofing for Horizontal Applications: Uniform, flexible, multilayered-composite sheet membrane that forms a permanent bond with fresh concrete placed against it; complete with accessories and preformed shapes for an unbroken waterproofing assembly; with the following physical properties:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc; MiraPLY-H.
 - b. GCP Applied Technologies Inc.; Preprufe 300R-Plus.
 - c. Polyguard Products, Inc.; Underseal Underslab Membrane.
 - d. W.R. Meadows, Inc; PRECON.
2. Physical Properties:
 - a. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D1970/D1970M.
 - b. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D903, modified.
 - c. Lap Adhesion: 5 lbf/in. (875 N/m) minimum; ASTM D1876, modified.
 - d. Hydrostatic-Head Resistance: 230 feet (70 m); ASTM D5385, modified.
 - e. Puncture Resistance: 200 lbf (890 N) minimum; ASTM E154/E154M.
 - f. Water Vapor Permeance: 0.01 perm (0.6 ng/Pa x s x sq. m) maximum; ASTM E96/E96M, Water Method.
 - g. Ultimate Elongation: 335 percent minimum; ASTM D412, modified.

- C. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.4 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- F. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C578, Type X, 1/2 inch (13 mm) thick.
- G. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm), predrilled at 9-inch (229-mm) centers.
- H. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 - 1. Thickness: Nominal 1/8 inch (3 mm).
 - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.
- I. Protection Course: Molded-polystyrene board insulation, ASTM C578, Type I, 0.90-lb/cu. ft. (15-kg/cu. m) minimum density, 1-inch (25-mm) minimum thickness.

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 waterproofing.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

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

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).
- F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.
 - 1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
 - a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
 - b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).
- D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.
- E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.
- F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- G. Seal edges of sheet-waterproofing terminations with mastic.
- H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.
- J. Immediately install protection course with butted joints over waterproofing membrane.
 - 1. Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 INSTALLATION OF BLINDSIDE SHEET WATERPROOFING

- A. Install blindside sheet waterproofing according to manufacturer's written instructions.
- B. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.
 - 1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detail tape.
- C. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.
- D. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- E. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

- F. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components; and to furnish reports to Architect.
- B. Waterproofing will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 13 26

SECTION 07 14 16
COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Polyurethane waterproofing.
 - 2. Rubber waterproofing.
- B. Related Requirements:
 - 1. Section 07 13 26 "Self-Adhering Sheet Waterproofing."
 - 2. Section 07 27 36 "Sprayed Foam Air Barriers" for materials to which transition to waterproofing as part of building envelope and for mockup and testing of wall assembly.
 - 3. Section 09 30 00 "Tiling" for fluid-applied waterproof membranes beneath ceramic tiles.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review waterproofing requirements including, but not limited to, the following:
 - a. Surface preparation specified in other Sections.
 - b. Minimum curing period.
 - c. Forecasted weather conditions.
 - d. Special details and sheet flashings.
 - e. Repairs.
 - f. Field quality control.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings:

1. Show locations and extent of waterproofing.
 2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
 3. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
1. Flashing sheet, 8 by 8 inches (200 by 200 mm).
 2. Membrane-reinforcing fabric, 8 by 8 inches (200 by 200 mm).

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
 1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, horizontal to vertical surface treatments, and protection.
 - a. Size: As indicated on Drawings (approximately 100 sq. ft. (9.3 sq. m) in area).
 - b. Description: Each type of wall / foundation installation.
 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. Refer to Section 07 27 36 for testing of mockup.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.
 1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
 2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 SINGLE-COMPONENT POLYURETHANE WATERPROOFING

- A. Single-Component, Modified Polyurethane Waterproofing: ASTM C836/C836M and coal-tar free.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; MasterSeal HLM 5000 (Pre-2014: Sonoshield HLM 5000).
 - b. Carlisle Coatings & Waterproofing Inc; MiraSEAL.
 - c. Polyguard Products, Inc.; Polyguard Commercial Stretch.
 - d. Tremco Incorporated; TREMproof 201/60.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated.
- C. Sheet Flashing: 50-mil- (1.3-mm-) minimum, nonstaining, uncured sheet neoprene.
 - 1. Adhesive: Manufacturer's recommended contact adhesive.
- D. Membrane-Reinforcing Fabric: Manufacturer's recommended fiberglass mesh or polyester fabric, manufacturer's standard weight.
- E. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.
- F. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C920, Type M, Class 25 or greater; Grade NS for sloping and vertical applications and

Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.

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 concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.
 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D4258.
- D. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

- A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in ASTM C1471/C1471M.
- B. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C1471/C1471M. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.
 - 1. Comply with ASTM C1193 for joint-sealant installation.
 - 2. Apply bond breaker on sealant surface, beneath preparation strip.
 - 3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least 6 inches (150 mm) wide along each side of joint. Apply waterproofing in two (2) separate applications and embed a joint reinforcing strip in the first preparation coat.

3.5 WATERPROOFING APPLICATION

- A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C1471/C1471M.
- B. Start installing waterproofing in presence of manufacturer's technical representative.
- C. Apply manufacturer's standard sealant or cant product at transition between horizontal to vertical surfaces and at inside corners.
- D. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.
- E. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
 - 1. Apply one (1) or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness of 60 mils (1.5 mm).
 - 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
 - 3. Apply detail coats at transitions between substrates.
 - 4. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft. (9.3 sq. m).
- F. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage onsite representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to Architect.

3.7 PROTECTION

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.

- C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

END OF SECTION 07 14 16

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

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

- B. Related Requirements:

- 1. Section 07 27 36 "Sprayed Foam Air Barrier" for spray-applied polyurethane foam insulating air barrier and transition membranes.
 - 2. Section 07 51 13 "Built-Up Asphalt Roofing" for insulation for roofing construction and transition membranes.

1.3 ACTION SUBMITTALS

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

- B. LEED Submittals: Comply with Section 01 81 13.

- 1. MR Credit 2: BPDO – Environmental Product Declarations.

- a. For insulation: Product-specific declaration or Industry-wide EPD or product-specific EPD.

- 2. MR Credit 3: BPDO – Sourcing of Raw Materials.

- a. For recycled content insulation: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

- 3. MR Credit 4: BPDO – Material Ingredients.

- a. For insulation, if available: Material Ingredient Report.

- 4. EQ Credit 2: Low-Emitting Materials.

- a. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

- b. For thermal and acoustic insulation installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.

C. Shop Drawings: For roof insulation:

- 1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets, and saddles.
- 2. Shop drawings shall include: Outline of roof, locations of drains, complete board layout of tapered insulation components, thicknesses, and the average R value for the completed insulation system.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight, except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:

- 1. Recycled Content: Provide mineral wool insulation with minimum 75 percent recycled content; provide polystyrene insulation with minimum 20 percent recycled content; provide glass fiber insulation with minimum 20 percent recycled content.
- 2. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- 3. Thermal and acoustic insulation installed within the building interior: Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dow Chemical Company (The).
 - 2. Owens Corning.
 - 3. Pactiv Building Products.

2.3 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Locations:
 - a. Exterior wall stud cavity.
 - b. Interior sound batt insulation in non-fire-rated construction.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation.
 - 2. Johns Manville; a Berkshire Hathaway company.
 - 3. Knauf Insulation.
 - 4. Owens Corning.

2.4 MINERAL-WOOL BLANKETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Johns Manville; a Berkshire Hathaway company.
 - 2. Rockwool International.
 - 3. Thermafiber, Inc.; an Owens Corning company.
- B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Locations:
 - a. Sound attenuating fire batt (SAFB) insulation.
 - b. Exterior ceilings and soffits, in multiple layers as required for indicated R-value.

2.5 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation (not in roofs): Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

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

3.3 INSTALLATION OF SLAB INSULATION

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

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install a continuous bed of adhesive on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 20 00 "Unit Masonry."

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.7 PROTECTION

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

3.8 BATT INSULATION SCHEDULE

- A. Provide batts sized to match stud construction, unless otherwise indicated, with R-values as follows:

1. Vertical 3-5/8" Stud: R-13 minimum.
2. Vertical 6" Stud: R-19 minimum.
3. Horizontal Applications: R-49 minimum.

END OF SECTION 07 21 00

SECTION 07 21 63
FLUID-APPLIED INSULATIVE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Fluid-applied insulative coating applied to structural steel.

- B. Related Requirements:

- 1. Section 05 12 00 "Structural Steel Framing."
 - 2. Section 07 27 36 "Sprayed Foam Air Barrier" for sprayed foam insulation and air barrier transition membranes.
 - 3. Section 09 90 00 "Painting and Coating" for finish coats applied over fluid-applied insulative coatings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer Qualifications.
- B. Installer Reports: Record of material batch number(s), product identification, and quantities used.
- C. Compatibility Test Reports: Report from manufacturer of fluid-applied insulative coating for compatibility with primers and finish topcoats

1.5 QUALITY ASSURANCE

- A. Installer: Company certified by manufacturer as trained in installation of products.
- B. Manufacturer: Company specializing in manufacturing products in this section with a minimum of two (2) years documented experience in manufacturing insulative technology.
- C. Preconstruction Compatibility Testing: Test for compatibility with proposed primers and finish coats provided in Division 05 and 09.

- D. Mockups: Build mockups to set standards for materials and execution including finish texture.
1. Install fluid-applied insulative coatings on one structural connection, as identified by Architect.
 2. Apply to minimum of two square foot area.
 3. Include insulative tape in assembly, if installer intends to include as part of work.
 4. Installer shall inspect mockup within one (1) hour of application for variance due to shrinkage, temperature, and humidity. Where shrinkage and cracking are evident, remove affected work, adjust mixture and method of application, and reapply.
 5. Apply finish coatings over fluid-applied insulative coatings.
 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original sealed, undamaged container with label intact.
- B. Protect stored materials from physical damage and from deterioration due to moisture, cold, heat, sun, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.7 FIELD CONDITIONS

- A. Project Environmental Requirements: Substrate and air temperature shall be in accordance with the manufacturers' requirements.
1. Protect work area from windblown dust and rain. Protect adjacent areas from over spray of material.
 2. Provide ventilation in areas to receive work of this section during application and minimum 24 hours after application.
- B. Temperature and Humidity Requirements: Maintain air temperature and relative humidity in areas where products will be applied for a time period before during and after application as recommended by manufacturer.
1. Do not apply fluid-applied insulative coating when temperature of substrate and/or surrounding ambient air temperature is below 45° F. Temporary protection and heat shall be maintained at this minimum temperature for 24 hours before, during and 24 hours after material application.
 2. Steel substrate temperature shall be a minimum of 5° F (3° C) above the dew point of the surrounding air for a period of 24 hours prior, during the application of the material and 24 hour cure period.
 3. Relative humidity of the application area shall not exceed a maximum of 85% 24 hours prior, during and 24 hours after the application of the material. The relative humidity shall not exceed 75% throughout the application and curing of the decorative top coat finish.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. LEED Requirements:

B. Materials Compatibility:

1. Provide shop and field primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

C. Fluid-applied insulative coatings shall be applied at the required thickness specified by the manufacturer in order to mitigate thermal bridging. In no case shall the K-value of the liquid applied thermal break be more than 0.040 W/mK.

2.2 PRODUCTS

A. Source Limitations: Provide products from a single manufacturer from a single source.

B. Fluid-Applied Insulative Coatings: Aerogel insulative coating for application to steel substrates, including primers.

1. Locations: Apply fluid-applied insulative coatings continuously on all surfaces of structural members penetration building envelope from a point 24 inches beyond exterior face of wall to a point 24 inches beyond interior face of wall. Where beam attaches to structural member (column or beam) within the extents of fluid-applied insulative coating, apply fluid-applied insulative coating on full length of attachment and continue along structural member until at a point 24 inches beyond the penetration's exit from face of wall measured along the structural members' length.

- a. Beam penetration at column C-23.
- b. Beam penetration at column C-20.
- c. Beam penetration at column AE-22.
- d. Beam penetration west of column AF-22.
- e. Beam penetration at column AF-19.
- f. Two beam penetrations west of column AF-15.

C. Manufacturer: Subject to compliance with requirements provide products by one of the following:

1. Cabot Corporation.
2. Tnemec Company, Inc.

D. Primers: Manufacturer's standard water-based cementitious epoxy, zinc-rich aromatic urethane, or mio-zinc-filled aromatic polyurethane primer.

1. Adhesion to Steel: 1,150 psi according to ASTM D 4541.
2. Salt Fog Corrosion: No blistering, cracking, or delamination of film, no more than 1/64" rust creepage at scribe, and no more than 3% rusting on plane at 10,250 hours, according to ASTM B 117.
3. Interior Primers: Passes the California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1-2010 (also known as Section 01350).

E. Thermal Insulative Coatings:

1. Abrasion Resistance: 50.2mg maximum loss after 1000 cycles according to ASTM D 4060.

2. Cyclic Salt Fog / UV Exposure: No blistering, cracking, rusting, or delamination after 5000 hours according to ASTM D 5894.
3. Humidity Resistance: No blistering, cracking, rusting, or delamination after 2,000 hours, according to ASTM D4585.
4. Surface Burning Characteristics: Class A according to ASTM E 84.
5. Thermal Conductivity: No greater than 0.0356 W/m-°K or 0.2468 BTU-in/ft2-hr-°F according to ASTM C518.
6. VOC Compliance: Passes the California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1-2010 (also known as Section 01350).

2.3 ACCESSORIES

- A. Insulative Tape: Manufacturer's aerogel insulative tape, with thermal conductivity of not more than 0.040 W/mK per layer.
 1. Locations: Where fluid-applied insulative coatings will be entirely concealed.
 2. Install multiple layers of insulative tape as required to achieve thermal conductivity.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements conditions affecting performance of the Work.
- B. Surfaces shall follow the manufacturer's written instructions and be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other foreign substances which would impair bond of the material to the substrate.
- C. Application of the fluid-applied insulative coating shall not commence until the installer has examined the substrates and determined the surfaces are acceptable.
- D. Verify that substrate and workspace temperature and humidity conditions are in accordance with manufacturers recommendations.
- E. Proceed with fluid-applied insulative coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates.
- B. Provide masking, drop cloths, or other suitable coverings to prevent overspray onto surfaces not intended to receive fluid-applied insulative coating.

- C. Provide adequately ventilation to remove all airborne dust before application of primer. Prior to the application of any coating material, the blast products, dust and debris shall be removed by vacuuming.
- D. Steel Substrates: Remove rust and loose mill scale.
 - 1. Prepare fabrication defects:
 - a. Correct steel and fabrication defects revealed by surface preparation.
 - b. Remove weld spatter and slag.
 - c. Round sharp edges and corners of welds to a smooth contour.
 - d. Smooth weld undercuts and recesses.
 - e. Grind down porous welds to pinhole-free metal.
 - f. Remove weld flux from surface.
 - 2. Ensure surfaces are dry.
 - 3. Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3, unless otherwise specified.
- E. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than eight (8) hours.

3.3 APPLICATION

- A. Apply fluid-applied insulative coating according to manufacturer's written instructions.
 - 1. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
 - 2. Keep containers closed when not in use to avoid contamination.
 - 3. Do not use mixed coatings beyond pot life limits.
 - 4. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- B. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- C. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- D. Apply primer at thickness recommended by manufacturer.
- E. Apply thermal insulative coating.
- F. Final Dry Film Thickness (DFT) shall be measured with a dry film thickness gauge.
- G. Steel deck is not to be sprayed unless otherwise indicated.

3.4 REPAIR

- A. Materials and Surfaces Not Scheduled to Be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: All patching and repair to material damaged shall be performed under this section and paid for by the trade responsible for the damage. Patching shall be performed by

applicators certified by the manufacturer and applied in accordance with the manufacturer application instructions.

- C. Coating Defects: Repair coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

- A. The Owner will engage an independent testing laboratory inspect and verify the application of material.
 - 1. Material inspection and testing shall be performed twenty-four (24) hours after completion of final application coat.
 - 2. Tests results shall be made available to all parties at the completion of each pre-designated area and approval.
 - 3. In-place material not in compliance with the specified thickness requirements shall be corrected prior to final acceptance.
- B. The dry film thickness (DFT) of the applied material shall be measured with a non-destructive coating thickness gage after material has completely cured. All measurements shall be documented in writing and furnished to the Owner.
- C. Manufacturer's Technical Services: Coordinate with coating manufacturer's technical service department or independent sales representative for current technical data and instructions.

3.6 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty containers, rags, and other discarded materials from Project site.
- B. Remove overspray materials from surfaces not required to be thermally protected.
- C. Protect surfaces of coating systems from damage during construction.

3.7 MAINTENANCE

- A. One-Year Inspection: Construction Manager will set date for one-year inspection of coating systems.
- B. Inspection shall be attended by Owner, Contractor, Architect, and manufacturer's representative.
- C. Repair deficiencies in coating systems as determined by Architect in accordance with manufacturer's instructions.

3.8 FLUID APPLIED INSULATION COATING SCHEDULE

- A. Steel Members Penetrating Exterior Building Envelope:
 - 1. Fluid Applied Thermal Break System, Water-Based:

- a. Surface Preparation: SSPC-SP6/NACE 3
 - b. Prime Coat (Shop or Field): Water-based cementitious epoxy primer, DFT 4.0 to 10.0 mils.
 - c. Intermediate Coat (Shop or Field) – Two (2) Coats: Thermal insulative coating, DFT of 40.0 to 50.0 mils per coat, total thickness: 90 to 100 mils.
 - d. Finish Coat: Compatible coating by Division 09.
2. Fluid Applied Thermal Break System, Zinc-Rich MCU Primer:
- a. Surface Preparation: SSPC-SP6/NACE 3
 - b. Prime Coat (Shop or Field): Zinc-rich aromatic urethane primer, DFT of 2.5 to 3.5 mils.
 - c. Intermediate Coat (Shop or Field) – Two (2) Coats: Thermal insulative coating, DFT of 40.0 to 50.0 mils per coat, total thickness: 90 to 100 mils.
 - d. Finish Coat: Compatible coating by Division 09.
3. Fluid Applied Thermal Break System, Mio-Zinc MCU Primer:
- a. Surface Preparation: SSPC-SP6/NACE 3
 - b. Prime Coat (Shop or Field): Mio-zinc-filled aromatic polyurethane primer, DFT of 2.5 to 3.5 mils.
 - c. Intermediate Coat (Shop or Field) – Two (2) Coats: Thermal insulative coating, DFT of 40.0 to 50.0 mils per coat, total thickness: 90 to 100 mils.
 - d. Finish Coat: Compatible coating by Division 09.

END OF SECTION 07 21 63

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vapor-permeable, fluid-applied air barriers.
- B. Related Requirements:
 - 1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
 - 2. Section 07 27 36 "Sprayed Foam Air Barriers" for spray foam air barriers and air barrier transition membranes.

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, UV-exposure limitations, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

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

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
- B. LEED Submittals: Comply with Section 01 81 13.
 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For air / vapor barriers, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 4: BPDO – Material Ingredients
 - a. For air / vapor barriers, if available: Material Ingredient Report.
- C. Shop Drawings: For air-barrier assemblies.
 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution.
 1. Build integrated mockups of exterior wall assembly as indicated on Drawings, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

- a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
- 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.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to jobsite in undamaged, unopened containers clearly marked by manufacturer with name of manufacturer and product.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight, heat, and cold.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. High-Build, Vapor-Permeable Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.

1. Synthetic Polymer Type:

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Henry Company; Air-Bloc 17MR or a comparable product by one of the following:

- 1) GCP Applied Technologies Inc. (formerly Grace Construction Products).
- 2) Tremco Incorporated.
- 3) Tyvek.

2. Physical and Performance Properties:

- a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
- b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method, Procedure A.
- c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
- d. Tensile Strength: 100 psi (700 kPa); ASTM D 412.
- e. Low-Temperature Flexibility: at -22 degrees F: Pass; ASTM D 1970.
- f. Nail Sealability: Pass; ASTM D 1970.
- g. Adhesion to Substrate: Minimum 30 lbf/sq. in. (207 kPa) when tested according to ASTM D 4541.
- h. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- i. Flame Spread and Smoke Development: 10 and 15, respectively; ASTM E 84.
- j. UV Resistance: Can be exposed to sunlight for ninety (90) days according to manufacturer's written instructions.
- k. Resistance to Mold, Mildew, and Fungal Growth: No growth; ASTM D 5590.
- l. Application Temperature: 20 to 105 degrees F (-6 to 40 degrees C).

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch (0.5 mm) thick, and Series 300 stainless-steel fasteners.
- D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; Dow Corning® 123 Silicone Seal.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; US11000 UltraSpan.
 - c. Pecora Corporation; Pecora XL-Span or Sil-Span.
 - d. Tremco Incorporated; Spectrem Simple Seal.

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 substrates are sound, and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints, expansion joints, and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
 - 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than twenty-four (24) hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip or preformed silicone extrusion so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
 - 2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than twenty-four (24) hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions, such as masonry ties.
 - 1. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness, as recommended in writing by manufacturer, to comply with performance requirements, but not less than 35 mils (0.9 mm), applied in two (2) equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements.
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Air-barrier dry film thickness.
 - 3. Continuous structural support of air-barrier system has been provided.
 - 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 5. Site conditions for application temperature and dryness of substrates have been maintained.
 - 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 7. Surfaces have been primed, if applicable.
 - 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 - 9. Termination mastic has been applied on cut edges.
 - 10. Strips and transition strips have been firmly adhered to substrate.
 - 11. Compatible materials have been used.
 - 12. Transitions at changes in direction and structural support at gaps have been provided.

13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure, as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 27 36
SPRAYED FOAM AIR BARRIER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Closed-cell sprayed polyurethane foam.
2. Sheet rubberized-asphalt barrier (SRAB) self-adhered air/vapor barrier membrane in roof assemblies.
3. Materials to bridge and seal air leakage pathways and gaps.
 - a. Connections of the walls to the roof air barrier.
 - b. Connections of the walls to the foundations.
 - c. Expansion joints.
 - d. Openings and penetrations of window frames, store fronts, and curtain walls.
 - e. Door frames.
 - f. Piping, conduit, duct and similar penetrations.
 - g. Masonry ties, screws, bolts and similar penetrations.
 - h. All other air leakage pathways in the building envelope.
4. Material to act as flashings and counterflashings.

B. Related Requirements:

1. Section 03 30 00 "Cast-In-Place Concrete" for underslab vapor barrier.
2. Section 04 20 00 "Unit Masonry" for masonry backup walls and veneer cavity walls.
3. Section 07 11 13 "Bituminous Dampproofing" for below-grade dampproofing of exterior walls.
4. Section 07 21 00 "Thermal Insulation" for foam-plastic board insulation.
5. Section 07 62 00 "Sheet Metal Flashing and Trim."

1.3 ACTION SUBMITTALS

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

- B. LEED Submittals: Comply with Section 01 81 13.

1. MR Credit 2: BPDO – Environmental Product Declarations.

- a. For air/ vapor barriers, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.

2. MR Credit 4: BPDO – Material Ingredients.

- a. For air / vapor barriers, if available: Material Ingredient Report.
- C. Shop Drawings: Show locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane flashings and counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.
- D. Samples: For each type of air/vapor barrier material, minimum 12 inches by 12 inches.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates: Certification of compatibility by air / vapor barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it.
- B. Manufacturer's Installation Instructions: Include instructions for evaluating, preparing, and treating substrate, temperature, and other limitations of installation conditions.
- C. Qualification Data: For Installer.
- D. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- E. Evaluation Reports: For spray foam air barrier, from ICC-ES.
- F. Installer's quality assurance program.
- G. Field Quality Control Reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. An authorized representative who is trained and approved by manufacturer.
 - 2. Contractor licensed and certified under Air Barrier Association of America's (ABAA's) Quality Assurance Program, at the time of bid and throughout duration of Work.
 - 3. Each worker who is installing spray foam air barriers must be either a Certified Applicator or an installer who is registered with ABAA.
 - 4. Installers must be trained and certified by ABAA/NECA and PSDI (Professional Skills Development Institute for Energy Conservation) in accordance with the training requirements outlined in the ULC S705.2-02 Installation Standard. Installers shall have their photo identification certification cards in their possession and available on the project site for inspection, upon request.
 - 5. References: Provide list of three (3) to five (5) projects completed in the last three (3) years using specified products, of similar size, scope, and complexity, including the following:
 - a. Project Name
 - b. Location
 - c. Date of Substantial Completion
 - d. Size of installation, in square feet of exterior wall sprayed
 - e. Thickness of Foam

- f. Was project ABAA inspected?
 - g. Air leakage test results, if available
 - h. List of Installers on the project who will be working on this Project
 - B. Single-Source Responsibility: Obtain air / vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.
 - C. Preconstruction Meeting: Convene one week prior to commencing Work of this section, in accordance with Division 01 requirements.
 - D. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on field mockups.
 - E. Mockups: Prior to installation of spray foam air barrier, apply spray foam air barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:
 - 1. Apply spray foam air barrier in field-constructed mock-ups of assemblies specified in Section 04 20 00.
 - 2. Apply spray foam air barrier in field-constructed mock-ups of assemblies per Division 01 requirements.
 - 3. Construct typical exterior wall panel, eight (8) feet long by eight (8) feet wide, incorporating back-up wall, partial cladding, window and doorframe and sill, insulation, flashing, building corner condition, junction with roof system foundation wall and typical penetrations and gaps; illustrating materials interface and seals. All transition membranes and seals shall be installed per the manufacturer's system requirements.
 - 4. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency
 - 5. Coordinate construction of mockups to permit inspection and testing of air barrier and components before external framing and cladding are installed.
 - 6. Test mock-up for air and water infiltration to conform with Division 01 Section Quality Control, in accordance with ASTM E 783 and ASTM E 1105.
 - 7. Adhesion Testing: Test mockups required air-barrier adhesion to substrate according to ASTM D 4541.
 - F. Cooperate with Owner's inspection and testing agency. Do not cover any installed spray foam air barrier unless it has been inspected, tested, and approved.
 - G. Protect people, materials, property, and other areas that may be negatively impacted from over-spray and contact with chemical and gases.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, expiration date, and directions for storage.
 - B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air / vapor barrier manufacturer. Protect stored materials from direct sunlight.
 - C. Avoid spillage. Immediately notify Owner and Construction Manager if spillage occurs and start clean up procedures.
 - D. Clean spills and leave area as it was prior to spill.

- E. Separate and recycle waste materials in accordance with Construction Waste Management requirements.
- F. Place materials defined as hazardous or toxic waste in designated containers.
- G. Ensure emptied containers are sealed and stored safely for disposal away from children.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Apply spray foam air barrier within range of ambient and substrate temperatures recommended by manufacturer. Do not apply spray foam air barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
 - 1. Do not apply spray foam air barrier in snow, rain, fog, or mist.
 - 2. Do not apply spray foam air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.
 - 3. The product shall not be installed after the expiry date printed on the label of each container. The product has a shelf life of six (6) months from the date of manufacture.

1.8 WARRANTY

- A. For sealant and membrane materials provide a twenty-four (24) month warranty period.
- B. Material Warranty: Provide manufacturer's three (3) year air / vapor barrier material warranty.
- C. System Warranty: Provide the manufacturer's three year system warranty, including the primary air/vapor barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Provide spray foam air barrier system constructed to perform as a continuous air and vapor barrier system, as building thermal insulation, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. System shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.
 - 1. Materials shall for spray foam air barrier shall be tested and conform to ASTM E 2178.
 - 2. Assemblies for spray foam air barrier shall be tested and conform to ASTM E 2357.
- B. Air Permeability: less than 0.01 L/(s*m²) when tested per ASTM E 2178.
- C. Vapor Permeability: Class II, per ASTM E 96.
- D. Adhesion to Substrate: 16 lbf/sq. in. when tested according to ASTM D 4541 as modified by ABAA.

2.2 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.9 lb/cu.ft. and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
1. Basis-of-Design Product: Subject to compliance with requirements, provide BASF Corporation; Walltite ® or a comparable product by one of the following:
 - a. Dow Chemical Company (The).
 - b. Henry Company.
 - c. Icynene-Lapolla; Icynene.
 2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 400 or less.
 - c. Tested Thickness: 3 inches minimum.
 3. Sprayed polyurethane foam material, when tested, shall meet the requirements of ULC S705.1-01 Standard for Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density, Material- Specification.
 4. A copy of an Evaluation Report (such as the CCMC Evaluation Report) or copies of the test reports from an accredited testing laboratory, for each physical property, indicating that the product meets the requirements of ULC S705.1-01 shall be made available upon request. A copy of either the evaluation report or the test reports shall be on file at the ABAA office.
 5. Material containers shall be labeled with the Evaluation Report number of the evaluation agency.

2.3 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended by spray foam air barrier manufacturer for intended use and compatible with the spray foam air barrier.
- B. Self-adhering modified asphalt/polyethylene flashing to counterflash metal flashings:
1. Bakor Blueskin® TWF.
- C. Primer: Water based liquid primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates;
1. Aquatac® as manufactured by Bakor Inc.
- D. Primer: Solvent based, VOC compliant primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates;
1. Blueskin® Primer by Bakor, Inc.
- E. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes by SRAB air / vapor barrier manufacturer.

- F. Stainless-Steel Sheet Flashing: ASTM A167, Type 304, soft annealed, with No. 2D finish; minimum, 0.0156 inch (0.4 mm) thick.
- G. Transition Strip: Self-adhering, smooth surfaced SBS modified bitumen membrane, nominal 40 mil thickness, width as required.
 - 1. Blueskin® SA as manufactured by Bakor Inc.
- H. Transition Strip Primer:
 - 1. Blueskin® Primer as manufactured by Bakor Inc.
- I. Sheet Membrane Transition Strip Termination Sealant:
 - 1. Polybitume 570-05 by Bakor Inc.
- J. Sheet Membrane Air Barrier Perimeter Seal to Windows, Doors, Curtainwall, Storefront, Louver, and other penetration systems: Non-reinforced, cured chloroprene polymer sheet (neoprene) complying with ASTM D2000 Designation 2BC415 to 3BC620, 50 to 65 mils (1.3 to 1.6 mm) thick.
 - 1. Adhesive: Typical contact-type adhesive used for fully-adhered membranes.
 - 2. Lap Sealant: Typical urethane or silicone lap and termination sealant used for membrane edges recommended by manufacturer.
 - 3. Termination bars and fasteners:
 - a. Stainless steel, Aluminum bars, and stainless fasteners Galvanized steel.
- K. Closure Membranes: Reinforced polymer membrane flashing for closure and bridging of cavity at windows, doors, curtainwall, storefront, louver, and other penetration systems.
 - 1. Hyload Jamb Closure Membrane.
- L. Sheet Membrane Sheet Membrane Air Barrier Perimeter Seal to Windows, Doors, Curtainwall and Storefront systems: Low modulus silicone sheet; provide manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit widths indicated, combined with a neutral-curing low modulus silicone sealant for bonding extrusions to substrates.
 - 1. Pecora Sil-Span.
 - 2. Dow 1-2-3 or equal.
- M. Provide sealants in accordance with Section 07 92 00 - Joint Sealants. Comply with ASTM C920 and ASTM C920 classifications for type, grade, class, and uses:
 - 1. Silicone Sealant Type A: natural cure, low modulus, to seal sheet membrane flashing to polyethylene face of sheet rubberized-asphalt barrier and to seal between and to non-bituminous sheet systems.
 - a. Acceptable materials:
 - 1) Dow 790.
 - 2) Pecora 864.
 - b. SPF (Sprayed Polyurethane Foam) Sealant: Provide one- or two-component, foamed-in-place, polyurethane foam sealant with the following characteristics:

- 1) Density: 1.5 to 2.0 PCF.
- 2) Flame Spread (ASTM E162): 25 or less.
- 3) Initial R-Value (at 1 inch): Not less than 7. Acceptable materials:
 - a) Zerodraft Foam Sealant.
 - b) Zerodraft Insulating Air Sealant.
 - c) Zerodraft (Division of Canam Building Envelope Specialists Inc.), 125 Traders Blvd. E., Unit # 4, Mississauga, ON, L4Z 2H3 Tel. 1-877-272-2626.

2. Substrate Cleaner: Non-corrosive type recommended by sealant manufacturer compatible with adjacent materials.

2.4 EQUIPMENT

- A. The equipment used to spray the polyurethane foam material shall be in accordance with ULC S705.2-02 and the equipment manufacturer's recommendations for specific type of application.
- B. Equipment settings are to be recorded on the Daily Work Record as required by the ULC S705.2-02 Installation standard.
- C. Each proportioner unit to supply only one (1) spray gun.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation. Concrete shall be cured and dry, smooth and without large voids, spalled areas, or sharp protrusions. Masonry shall have joints struck flush, completed filled with mortar, and all excess mortar on face of masonry and ties removed.
 1. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 2. Notify Architect in writing of anticipated problems using air/vapor barrier over substrate.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air / vapor barrier application.
- B. Prime masonry, concrete substrates with conditioning primer when installing modified asphalt membrane transition membranes.
- C. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond to transition membranes, with adequate drying time between coats.

- D. Prime wood, metal, and painted substrates with primer recommended by membrane manufacturer.
- E. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air / vapor barrier and at protrusions according to air/vapor barrier manufacturer's written instructions and approved tested system in accordance with ABAA air barrier testing protocol.
 - 1. Verify that surfaces and conditions are suitable to accept work as outlined in this section.
 - 2. Prior to commencement of work report in writing to the architect any defects in surfaces or conditions that may adversely affect the performance of products installed under this section.
 - 3. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.
 - 4. Examine joints before sealing to ensure configurations, surfaces and widths are suitable for spray polyurethane foam. Report in writing all defects stating the locations of joints deemed unacceptable for the application of the spray polyurethane foam.

3.3 PREPARATION

A. Protection:

- 1. Mask and cover adjacent areas to protect from over spray.
- 2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
- 3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes remain out of existing and finished areas. Provide for make-up air.
- 4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

B. Surface Preparation

- 1. Surfaces to receive foam insulation shall be clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the substrate.
- 2. Ensure that all work by other trades that may penetrate through the air barrier system is in place and complete.
- 3. Ensure that surface preparation and any primers required conform to the manufacturer's instructions.
- 4. Prepare surfaces by brushing, scrubbing. Scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants, which will affect adhesion and integrity of the spray polyurethane foam. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam. Ensure surfaces are dry before proceeding.
- 5. Install transition membranes to all applicable surfaces and ensure proper adhesion of the transition membranes to the substrate, capable of having spray polyurethane foam insulation.
- 6. Install counter-flashings:
 - a. Metal: Mechanically fasten metal counter-flashings with screws at 8" (200 mm) o.c.
 - b. Membrane: Cut into and uncover only 3" of siliconized release paper along one edge of the counter-flashing membrane. Adhere membrane flashing to the pre-primed substrate a minimum of 3" and roll firmly in place.

7. Ensure veneer anchors are in place.

3.4 INSTALLATION

- A. Spray-application of polyurethane foam shall be installed in accordance with ULC S705.2-02 and the manufacturer's instructions.
- B. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the ULC S705.2 Installation standard.
- C. Apply in consecutive passes, as recommended by manufacturer, to thickness as indicated on drawings. Passes shall be not less than ½ inch and not greater than 2 inches.
- D. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
- E. Finished surface of foam insulation to be free of voids and embedded foreign objects.
- F. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
- G. Trim, as required, any excess thickness that would interfere with the application of cladding / covering system by other trades.
- H. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
- I. Do not permit adjacent work to be damaged by work of this section. Damage to work of this section caused by other sections shall be repaired by this section at the expense of the subcontractor causing the damage.
- J. Complete connections to other components or repair any gaps, holes or other damage using material which conforms to ULC S710.1 Polyurethane Sealant Foam – One Component – Material or ULC S711.1 Polyurethane Sealant Foam – Two Components – Material and shall be installed in accordance with ULC S710.2 Polyurethane Sealant Foam – One component – Installation or ULC S711.2 Polyurethane Sealant Foam – Two Component – Installation, whichever is appropriate.
- K. Tolerance: Maximum variation from indicated thickness minus 1/4 inch, plus 1/2 inch.

3.5 FIELD QUALITY CONTROL

- A. Mockup Tests: As determined by testing agency from among the following tests:
 1. Adhesion Testing: Air-barrier membranes assemblies will be tested for required adhesion to substrate according to ASTM D 4541.
- B. Site Tests
 1. The Licensed Installer shall conduct daily visual inspection, adhesion / cohesion testing and density measurements as outlined by the ULC S705.2-02 Installation standard.
 2. The Licensed Installer shall complete the Daily Work Record and record all information required including the results of the testing. The Daily Work Record shall be kept on site

for routine inspection. Copies of the Daily Work Record shall be forwarded to the owner or owner's representative upon request. Copies of the Daily Work Record or monthly summaries shall be sent to the ABAA office on a monthly basis as required by the Quality Assurance Program.

3. Transition membranes shall be pull tested in accordance with the ABAA Quality Assurance Program requirements before installing the spray polyurethane air barrier material.
4. The costs incurred for daily testing and inspection by the Licensed Installer and the completion of the Daily Work Record shall be borne by the Licensed Contractor.

C. Inspection

1. Arrange for site inspections by ABAA. The cost of inspections shall be included in the bid provided by the Licensed Contractor.
2. The ABAA site-inspections shall verify conformance with the manufacturers instructions, the standard ULC S705.2-02 Installation standard, the ABAA Quality Assurance Program, and this section of the project specification.
3. Inspections and testing shall be carried out at 5%, 50% and 95% of completion. A written inspection report shall be forwarded to the architect, the owner's representative, the Contractor, and the ABAA-licensed installer within 3 working days of the inspection and test being performed. In the case of any deficiencies, the ABAA-licensed inspector may verbally advise the licensed installer at the time of the inspection.
4. If the inspection reveals any defects, the Licensed Contractor shall immediately rectify all such defects at his cost.

3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures including ultraviolet radiation, physical abuse, and other causes.
- B. Cover spray polyurethane foam with a thermal barrier when installed on the interior of the building.

END OF SECTION 07 27 36

SECTION 07 42 13.13
FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Concealed-fastener, lap-seam metal wall panels.

- B. Related Sections:

- 1. Section 07 42 93 "Soffit Panels" for metal panels used in horizontal soffit applications.
 - 2. Section 10 82 13 "Exterior Grilles and Screens" for supports on which perforated metal wall panels are attached.

1.3 PREINSTALLATION MEETINGS

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

- 1. Meet with metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and Installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for metal panel assembly during and after installation.
 - 8. Review of procedures for repair of metal panels damaged after installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. LEED Submittals: Comply with Section 01 81 13.
 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For wall panels: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content wall panels: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings:
 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
 1. Include Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. LEED Requirements:

1. Recycled Content: If necessary to meet required LEED threshold, provide panels with recycled Content.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials, due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Reveal-Joint, Concealed-Fastener Metal Wall Panels (**MWP-1**): Formed with interlocking panel edges and intermediate stiffening ribs between panel edges; with narrow reveal joints between panels.

1. Basis-of-Design: Subject to compliance with requirements, provide Centria Architectural Systems; CS-610 panel wall system, or a comparable product by one of the following:

- a. ATAS International, Inc.
 - b. Drexel Metals, Inc.
 - c. Garland Company, Inc. (The), IMETCO.
 - d. Morin - A Kingspan Group Company.
 - e. PAC-CLAD; Petersen Aluminum Corporation.
 - f. Merchant & Evans, Inc.
 - g. Tremco.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.028 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Panel Coverage: 16 inches (406 mm).
 4. Panel Height: 0.875 inch (22 mm).
- C. Perforated, Reveal-Joint, Concealed-Fastener Metal Wall Panels (**MWP-2**): Formed with interlocking panel edges and intermediate stiffening ribs between panel edges.
1. Basis-of-Design: Subject to compliance with requirements, provide Centria Architectural Systems; EcoScreen CS-660 panel wall system, or a comparable product by one of the following:
 - a. ATAS International, Inc.
 - b. Drexel Metals, Inc.
 - c. Fabral.
 - d. Garland Company, Inc. (The), IMETCO.
 - e. Morin - A Kingspan Group Company.
 - f. PAC-CLAD; Petersen Aluminum Corporation.
 - g. Merchant & Evans, Inc.
 - h. Tremco.
 2. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper, as required to suit forming operations and structural performance required.
 - a. Thickness: 0.040 inch (1.02 mm).
 - b. Surface: Smooth, flat finish.
 - c. Perforations: 30 percent openness, 1/8 inch diameter at 7/32 inch spacing.
 - d. Exterior Finish: Two-coat fluoropolymer.
 - e. Color: As selected by Architect from manufacturer's full range.
 3. Panel Coverage: 16 inches (406 mm).
 4. Panel Height: 0.875 inch (22 mm).
 5. Location: Roof equipment screens.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections, as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary, to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels, as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
 - 2. Concealed Finish: Apply pretreatment and 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 (0.013 mm).
- D. Aluminum Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 - 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action, as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere, as needed, to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
 2. 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 (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used

or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories.
- B. Remove and replace metal wall panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare inspection reports.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces, as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.13

SECTION 07 42 13.19
INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Foamed-insulation-core metal wall panels.
- B. Related Requirements:
 - 1. Section 07 42 93 "Soffit Panels" for metal panels used in horizontal soffit applications.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for metal panel assembly during and after installation.
 - 8. Review procedures for repair of metal panels damaged after installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. LEED Submittals: Comply with Section 01 81 13.
 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For wall panels: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content wall panels: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings:
 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. LEED Requirements:

1. Recycled Content: If necessary to meet required LEED threshold, provide panels with recycled Content.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E72:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. General: Provide factory-formed and -assembled metal wall panels fabricated from two (2) metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
 - b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D1622.
 - c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D1621.
 - d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C273/C273M.
- B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
1. Basis-of-Design Product: Subject to compliance with requirements, provide CENTRIA Architectural Systems; Formawall Dimension Series or a comparable product by the following:
 - a. Kingspan Insulated Panels; Benchmark 4000 series.
 2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.028 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - 1) Color: As selected by Architect from manufacturer's full range.
 3. Panel Coverage: As indicated.
 4. Panel Thickness: 2.5 inches (64 mm).
 5. Thermal-Resistance Value (R-Value): R-17 according to ASTM C1363.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets,

fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. 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.
 2. Concealed Finish: Apply pretreatment and 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 (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.
 - 1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSULATED METAL WALL PANEL INSTALLATION

- A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
 - 1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.

2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
 4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
 6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
- B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
1. Install clips to supports with self-tapping fasteners.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
 2. 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 (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- B. Metal wall panels will be considered defective if they do not pass test and inspections.
- C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.19

**SECTION 07 42 93
SOFFIT PANELS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal soffit panels.
- B. Related Sections:
 - 1. Section 074213.13 "Formed Metal Wall Panels" for lap-seam metal wall panels.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For soffit panels: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content soffit panels: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.
- 1.5 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For Installer.
 - B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- 1.6 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
 - A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- 1.8 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
 - B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
 - C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
 - D. Retain strippable protective covering on metal panels during installation.
- 1.9 FIELD CONDITIONS
 - A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Recycled Content: If necessary to meet required LEED threshold, provide panels with recycled Content.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

- A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with flush joint between panels.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ATAS International, Inc.
 - b. CENTRIA Architectural Systems.
 - c. Drexel Metals.
 - d. Garland Company, Inc. (The).
 - e. Merchant and Evans.
 - f. Morin - A Kingspan Group Company.
 - g. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
 - h. Tremco.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.028 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Panel Coverage: 12 inches (305 mm).
 4. Panel Height: 0.375 inch (10 mm).

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation

unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum ~~1-inch-~~ (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape ~~1/2 inch~~ (13 mm) wide and ~~1/8 inch~~ (3 mm) thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
 2. Concealed Finish: Apply pretreatment and 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 (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
 - a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.
 - 1. Soffit Framing: Wire tie furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 INSTALLATION

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Apply panels and associated items true to line for neat and weathertight enclosure.
 - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 - 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 - 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum **6-inch (152-mm)** end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. 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 (610 mm)** of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 93

**SECTION 07 51 13
BUILT-UP ASPHALT ROOFING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Built-up asphalt roofing.
- 2. Vapor retarder.
- 3. Roof insulation.
- 4. Walkways.

B. Related Requirements:

- 1. Section 07 21 00 "Thermal Insulation" for insulation beneath the roof deck.
- 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counter-flashings.
- 3. Section 07 71 00 "Roof Specialties."
- 4. Section 07 71 29 "Manufactured Roof Expansion Joints."
- 5. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
- 6. Section 22 14 23 "Storm Drainage Piping Specialties" for roof drains, lambstongues, and downspout adapters and boots.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to Work of this Section.

1.4 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 manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - a. Absence of roofing manufacturer's representative will result in \$500.00 deduct from Roofing Contract.
- 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 base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.
 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For roofing membrane and glass mat gypsum panels, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 4: BPDO – Material Ingredients
 - a. For roofing and coatings and glass mat gypsum panels, if available: Material Ingredient Report.
 3. SS Credit 5: Heat Island Reduction
 - a. For roof surface materials: Documentation indicating initial Solar Reflectance Index (SRI) value or three-year aged SRI value.
- C. Shop Drawings: For built-up roofing. Include plans, elevations, sections, details, and attachments to other work, including:
 1. Base flashings and built-up terminations.
 2. Tapered insulation, including slopes.
 3. Crickets, saddles, and tapered edge strips, including slopes.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations, and extents of these locations on the roof plan.
 5. Vapor retarder details and transitions to adjacent assemblies.
- D. Samples for Verification: For the following products:
 1. Ply, flashing backer, and flashing sheet.
 2. Roof insulation and fasteners.
 3. Aggregate surfacing material in gradation and color required.
 4. Roof paver, full sized, in each color and texture required.
 5. Walkway pads or rolls, of color required.
 6. Vapor retarder and accessories.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
 - 1. Contractor shall provide references from five building owners for similar systems of comparable size (+/- 25 percent) within the past five years.
 - 2. Contractor shall provide list of tradesmen, with work experience with similar roofing systems, identifying specific projects performed in the past five years.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that built-up roofing complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements signed and sealed by a qualified professional engineer.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system and that Installer has been an "NDL" Certified Roofing System Installer for not less than five years.
- D. Product Test Reports: For components of built-up roofing, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Indicate that bulk roofing asphalt materials delivered to Project comply with requirements. Include quantity and statistical and descriptive data for each product. Submit certificate with each load before it is used.
 - 2. Include continuous log showing time and temperature for each load of bulk asphalt indicating date obtained from manufacturer, where held, and how transported before heating and application on roof.
- E. Research/Evaluation Reports: For components of built-up roofing, from ICC-ES.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.
- H. Adhesion test data and letters of compatibility for transition membranes to project-specific interface products.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM approved for built-up roofing identical to that used for this Project.
- B. Installer Qualifications:
 - 1. A qualified firm that is approved, authorized, or licensed by built-up roofing manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

2. Installer must have not less than five years' experience installing the specified roofing systems.
3. Whenever any installer personnel are present at the site, Installer shall maintain on-site a full-time supervisor/foreman who is fluent in English and experienced in installing roofing systems with products and of scope similar to Work.
4. Installer shall be prequalified with Owner. Preapproved Contractors per RFQ 14MISC2 are as follows:
 - a. Autumn Contracting Inc., Springfield, Virginia.
 - b. CHU Contracting Inc., Chantilly, Virginia.
 - c. Citiroof Corporation, Columbia, Maryland.
 - d. Cole Roofing Co Inc., Baltimore, Maryland.
 - e. Heidler Roofing Services Inc., Hagerstown, Maryland.
 - f. Interstate Corporation, Gaithersburg, Maryland.
 - g. J&K Contracting Inc., Upper Marlboro, Maryland.
 - h. J&R Roofing Co Inc., Jessup, Maryland.
 - i. Kalkreuth Roofing & Sheet Metal Inc., Frederick, Maryland.
 - j. Kline Associated Roofing Contractors Inc., Hagerstown, Maryland.
 - k. R D Bean Inc., Beltsville, Maryland.
 - l. Ruff Roofers Inc., Baltimore, Maryland.
 - m. Simpson of Maryland Inc., Hanover, Maryland.
 - n. Simpson Unlimited Inc., Manassas, Virginia.
 - o. Tri-State Roofing & Sheet Metal Co., Ridgely, West Virginia.
 - p. Vatica Contracting Inc., Hyattsville, Maryland.

1.9 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 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.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of built-up roofing that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes built-up roofing membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and other components of built-up roofing. (Total System Warranty)
 - 2. Warranty Period: 25 years NDL (No Dollar Limit) from date of Substantial Completion.
 - 3. Periodic Inspections: Roofing system manufacturer shall inspect roof, perform any preventative maintenance required, and provide Owner with written inspection report including photographs showing condition of roof and any maintenance required.
 - a. Inspection Times: 2, 5, 10, 15, and 20 years from Date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of built-up roofing such as built-up roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.
 - 2. During warranty period, Contractor shall repair all leaks within 24 hours of notification of leak.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Firestone.
 - 2. GAF.
 - 3. Johns Manville.
 - 4. Simon Roofing.
 - 5. Tremco, Inc.
- B. Substitutions: Substitution requests for roofing system manufacturer shall be submitted not less than 10 days prior to bid, and in accordance with Instructions to Bidders. Substitution requests received after Bid will not be accepted.
- C. Source Limitations: Obtain components including roof insulation and fasteners from same manufacturer as built-up roofing or manufacturer approved by built-up roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Solar Reflectance Index (SRI) for low-sloped roof surface materials: Minimum 82 initial SRI; minimum 64 for 3-year aged SRI, when tested according to CRRC-1.

- B. General Performance: Installed built-up roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Built-up roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D4272.
- C. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by built-up roofing manufacturer based on testing and field experience.
- D. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
 - 1. Corner Uplift Pressure: As indicated on Drawings.
 - 2. Perimeter Uplift Pressure: As indicated on Drawings.
 - 3. Field-of-Roof Uplift Pressure: As indicated on Drawings.
- E. FM Global Listing: Built-up roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
 - 2. Hail-Resistance Rating: SH.
- F. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- G. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 ROOFING MEMBRANE SHEET MATERIALS

- A. Base Sheet: ASTM D 4601, Type II, SBS-modified asphalt-impregnated and -coated sheet, with glass-fiber-reinforcing mat, dusted with fine mineral surfacing on both sides, waterproof.
 - 1. Basis-of-Design: Tremco; BURmastic Supreme Composite Ply.
 - 2. Weight: 37 lb/100 sq. ft. minimum.
 - 3. Tensile Strength: Not less than 303 lbf/in in machine direction and 287 lbf/in in cross machine direction when tested according to ASTM D 5147.
 - 4. Tear Strength: Not less than 480 lbf in machine direction and 458 lbf in cross machine direction when tested according to ASTM D 5147.
 - 5. Pliability: 1/2 inch radius bend with no failure when tested according to ASTM D 146.
 - 6. Thickness: 0.067 inches minimum.
 - 7. Minimum Asphalt Content: 10 lb per 100 sq.ft.
- B. Ply Sheet: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.
 - 1. Three plies.

2.4 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D 2178, Type VI, asphalt-impregnated, glass-fiber felt.
 - 1. Two plies.
- B. Glass-Fiber Fabric: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D 1668, Type I.
- C. Elastomeric Sheetting: White thermoplastic sheeting from Elvaloy, CPE, or PVC elastomer reinforced with polyester scrim, meeting requirements of ASTM D 4434, Type IV.
 - 1. Thickness: 0.045 inches.
- D. Roofing Fabric: Asphalt saturated cotton fabric, 3.5 ounces per square yard, ASTM D 173.
- E. Stripping Ply for Flashings Ply Laps: Woven glass-fiber reinforced fabric treated with organic resin, ASTM D 1668, Type III.
 - 1. Minimum Size: 6 inches.
 - 2. Adhesive: Solvent-free flashing adhesive.
- F. Stripping Ply for 2-ply Stripping of Metal Flange Flashings:
 - 1. Base Layer: Roof membrane base sheet, 6 inches minimum.
 - 2. Top Layer: Roof membrane base sheet, 9 inches minimum, extending not less than 3 inches beyond base layer.
 - 3. Stripping Ply Adhesive: Hot asphalt, ASTM D 312, Type III.
 - 4. Primer for Metal Flanges:
 - a. Water-based primer.
 - b. Low-VOC primer.
- G. Flashing Sealant Tape: Flexible butyl-based Teflon sealant tape, 1/8 inch by 1 inch.
- H. Liquid Flashing and Primer: Basis-of-Design: Tremco; Wall Tite and Wall Tite Primer.

2.5 ASPHALT MATERIALS

- A. Asphalt Primer: ASTM D 41/D 41M
 - 1. Water-based, polymer modified asphalt primer.
 - 2. Low-VOC solvent-based asphalt primer.
- B. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by built-up roofing manufacturer for application, odor suppressant additive.

2.6 AUXILIARY BUILT-UP ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Cold-Applied Adhesive: Roofing manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with built-up base flashings. Containers shall be marked with UL and FM logos indicating materials were manufactured under specified UL and FM quality assurance programs.
- C. Asphalt Roofing Cement: ASTM D 4586, Type II, Class 1, one-part, asbestos free, compatible with roofing membranes and flashings.
- D. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- E. Elastomeric Sheeting Adhesive:
 1. Solvent-free elastomeric roofing mastic: One-part bonding adhesive, asbestos-free, low-odor, compatible with roofing membranes and flashings.
 2. Horizontal Stripping Adhesive for flashing for roof membrane: White reflective flood coat with reinforcing mesh in three-course application.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening built-up roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.
 1. Toggle Bolts: Two-part assembly consisting of machine screw and spring wing toggle, carbon steel plated for corrosion resistance.
 2. Anchor Bolts for Wood Blocking: FF-S-325, Group II, Type 4, Class 1 or Type 3, Class 3; 1/2 inch diameter galvanized steel anchor bolt stud with expansion collar (Rawl-Stud or Rawl Lok/Bolt by Powers). Length to penetrate substrate 2-1/2 inches.
 3. Roof membrane to wood nailers: Capped roofing nail, ring shank, round head.
 - a. Basis-of-Design: Simplex Nails; "Original" Cap Nails or other product approved in writing by roofing manufacturer, 1-1/4 inch shank length.
 4. Fastener Length:
 - a. Provide length of fastener as required to meet minimum penetration through roof deck.
 - b. Cellular Acoustical Deck: Provide fasteners that will not penetrate bottom finished surface of exposed roof deck.
- G. Aggregate Surfacing: ASTM D 1863, equivalent to No. 7 Texas White Chip, double-washed, free of clay, sand, loam and other foreign substance, clean, dry, opaque.
- H. Temporary Tie-In Material: ASTM D 4601, Type II, G2 base sheet, non-perforated, asphalt impregnated, coated glass fiber, fine mineral surfacing on both sides.
- I. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.7 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, **1/2 inch (13 mm)** thick, factory primed.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [CertainTeed Corporation](#); GlasRoc Sheathing.
 - b. [Georgia-Pacific Gypsum LLC](#); Dens Deck Prime.
 - c. [National Gypsum Company](#); Gold Bond eXP Extended Exposure Sheathing.
 - d. [USG Corporation](#); Securock Glass Mat Roof Board.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.8 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder, Type 1: Aluminum foil laminated to layer of self-adhesive SBS backing, minimum **15-mil- (0.38-mm-)** total thickness; maximum permeance rating of **0.05 perm (3 ng/Pa x s x sq. m)**; cold applied, with slip-resisting surface and poly release film backing, designed for direct application over metal decks prior to installation of insulation.
1. Basis-of-Design: Subject to compliance with requirements provide Carlisle; VapAir Seal MD Air and Vapor Barrier, or other product approved in writing by roofing manufacturer.
- B. Self-Adhering Sheet Vapor Retarder, Type 2: ASTM D 1970, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum **40-mil- (1.0-mm-)** total thickness; maximum permeance rating of **0.1 perm (6 ng/Pa x s x sq. m)**; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.
- C. Accessories: Provide flashing, primer, and other accessories recommended by manufacturer.

2.9 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas Roofing Corporation](#).
 - b. Celotex.
 - c. [Firestone Building Products](#).
 - d. [Johns Manville; a Berkshire Hathaway company](#).
 - e. Tremco, Inc.
 - f. Product approved in writing by roofing manufacturer.
 2. Insulation Thickness:

- a. Roof Types 1, 1A, 1B, 1C: Not less than two layers of insulation, minimum 2 inches thick per layer, total insulation thickness 5-1/2 inches minimum.
 - b. Roof Type 2: Minimum 1-1/2 inches thick per layer, total insulation thickness 2 inches minimum.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of **1/4 inch per 12 inches (1:48)** unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain, fabricated to slope of twice the roof system slope (**1/2 inch per 12 inches (1:24)**) unless otherwise indicated.

2.10 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with built-up roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate and acceptable to roofing manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Full-spread spray-applied, low-rise, two-component urethane adhesive.
- D. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- E. Wood Nailer Strips: Comply with requirements in Section 06 10 53 "Miscellaneous Rough Carpentry."
- F. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- G. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, **1/2 inch (13 mm)** thick, factory primed.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Gypsum LLC; Dens Deck Prime.
 - b. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - c. USG Corporation; Securock Glass Mat Roof Board.
- H. Substrate Joint Tape: **6- or 8-inch- (150- or 200-mm-)** wide, coated, glass fiber.

2.11 COATING MATERIALS

- A. If required to achieve SRI performance values, provide coating over white aggregate surfacing.
- B. Roof Coating: Acrylic elastomer emulsion coating, formulated for use on bituminous roof surfaces and complying with ASTM D 6083.
 - 1. Color: White.

2.12 WALKWAYS

- A. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 1/2 inch (13 mm) thick, minimum.

- 1. Pad Size: Approximately 36 by 60 inches (914 mm by 1524 mm).

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 cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
 - 4. Verify that concrete curing compounds that impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION, GENERAL

- A. Comply with built-up roofing manufacturer's written instructions
- B. Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg F (14 deg C) of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.
 - 1. Apply hot roofing asphalt within plus or minus 25 deg F (14 deg C) of equiviscous temperature. Discard material that does not meet temperature standard.

2. Provide and use thermometers at asphalt heating area(s) and at point of application. If thermometers are not on site, Owner's Representative will halt work until they are delivered.
- C. Cold Process Adhesive Heating: An in-inline heat unit exchange unit may be used to facilitate application.
1. Maximum adhesive temperature: **100 deg F**. Do not exceed flash point of adhesive.
 2. Heat exchange unit: Filled with heat transfer oil approved by equipment manufacturer.
 3. Follow equipment manufacturer's recommended operation procedures.
- D. Locate asphalt heating to remain down wind of adjacent school building and outdoor areas. Relocate if wind shifts or if directed by Owner's representative.
- E. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction. Tape joints where asphalt is directly applied to a substrate.
- F. Owner's Representative has power to order the permanent removal from the site of any employee of the Contractor for incompetence or interference with the adjacent school's operations. Owner Representative has power to stop Work if he/she believes that work is not progressing in accordance with Contract requirements or manufacturer's specifications. Contractor shall immediately comply with directive of Owner's Representative.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Where indicated, install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to built-up roofing manufacturer's written instructions.

3.5 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of **3-1/2 inches (90 mm)** and **6 inches (150 mm)**, respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into built-up roofing.

3.6 INSULATION INSTALLATION

- A. Install one lapped base-sheet course and mechanically fasten to substrate according to built-up roofing manufacturer's written instructions.

- B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation with long joints of insulation in a continuous straight line, with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding **1/4 inch (6 mm)** with insulation.
 - 1. Cut and fit insulation within **1/4 inch (6 mm)** of nailers, projections, and penetrations.
- E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is **2.7 inches (68 mm)** or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of **6 inches (150 mm)** in each direction.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water. Install 4 foot by 4 foot tapered insulation sump at roof drain locations.
- G. Install tapered insulation saddles or crickets to maintain positive drainage along valley lines between roof drains and scuppers, along walls, at high side of roof curbs, and as instructed at Preinstallation Roofing Conference.
 - 1. Saddle widest width shall equal or exceed 1/3 of distance between roof drains or scuppers.
 - 2. Contractor is responsible for additional work necessary for elimination of ponding water along valley lines.
- H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- I. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 3. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt. Immediately after placement walk insulation boards into adhesive.
- J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of **6 inches (150 mm)** in each direction. Loosely butt cover boards together and fasten to roof deck as required. Tape joints if required by roofing manufacturer.
 - 1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
 - 3. Apply hot roofing asphalt to underside and immediately bond cover board to substrate.

3.7 BUILT-UP ROOFING INSTALLATION, GENERAL

- A. Install roofing according to roofing manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
 - 1. Install roofing system BU-4-I-A-A, according to roof assembly identification matrix and roof assembly layout illustrations in NRCA's "The NRCA Roofing and Waterproofing Manual" as well as Section requirements.
- B. Start installation of built-up roofing in presence of manufacturer's technical personnel.
- C. Where roof slope exceeds **1/2 inch per 12 inches (1:24)**, install built-up roofing sheets parallel with slope.
- D. Coordinate installation of roofing so insulation and other components of built-up roofing not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed built-up roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.8 ROOFING MEMBRANE INSTALLATION

- A. Install lapped base-sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 - 1. Adhere to substrate in a solid mopping of hot roofing asphalt, at same minimum application rate as for ply sheets.
- B. Install three ply sheets starting at low point of roofing. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.
 - 1. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching. Extend past lap edges to ensure complete adhesion.
 - 2. Overlap starter strips 28 inches with first ply, and then overlap each succeeding ply by 26-1/2 inches.
 - 3. Use 9-, 18-, 27-, and 36-inch wide plies to start and finish roof membrane along roof edges and terminations.
 - 4. Immediately after installation, broom or roll ply sheet with uniform and continuous pressure to ensure complete, continuous seal and contact between adhesive and felts, including ends, edges, and laps, without wrinkles, fish-mouths, blisters, or other defects. Use minimum 34-inch wide broom or roller.
 - 5. Do not walk on plies until adhesive has set.
 - 6. Overlap previous day's work by 24 inches.
 - 7. Lap ply membrane ends 4 inches, staggering end laps 3 feet minimum.

8. Minimum Application Rate (excluding water stop/tie-off, flashings, miscellaneous detail application, and minimum kettle capacity): 25 pounds per 100 square feet +/- 20 percent.
- C. Set-On Accessories: Where small roof accessories are set on built-up membrane, set metal flanges in continuous bed of roofing cement and seal membrane penetration with bead of roofing cement to prevent flow of asphalt from membrane.

3.9 GENERAL FLASHING REQUIREMENTS AND STRIPPING INSTALLATION

- A. Install Elastomeric Flashing using flashing adhesive:
 1. Adhere elastomeric sheeting completely to flashing surface, cant, and roofing with a 1/4 inch notched trowel at 1 gallon per 12 sq. ft. of Solvent Free flashing adhesive, immediately embed elastomeric sheeting into the flashing adhesive.
 2. Apply consistent pressure to entire surface of elastomeric sheeting using a steel hand roller to achieve full adhesion of the sheeting to the flashing substrate. Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 6 inches.
- B. Adhere laps with Solvent Free Adhesive.
 1. Seal horizontal edges of sheeting to roof surface and vertical edges of sheeting with reinforcing mesh embedded in a base course of Solvent Free mastic and a top course of solvent free elastomeric flashing adhesive.
 2. Elastomeric sheeting width: Sufficient to extend at least 6 inches beyond toe of cant onto new roof.
 3. Secure top edge of flashing membrane with metal termination bar and Teflon Tape mechanically. Fasten bar 6 to 8 inches o.c. Seal termination bar with three-course reinforcing mesh and asphaltic mastic as required.
- C. Two Ply striping for metal flanges:
 1. Set flange in asphalt mastic. Seal flange with two striping plies embedded between alternate applications of striping adhesive/bitumen. Extend first ply 3 inches beyond flange; second ply 3 inches beyond first ply

3.10 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to built-up roofing manufacturer's written instructions and as follows:
 1. Prime substrates with asphalt primer if required by built-up roofing manufacturer.
- B. Flashing Sheet Application: Adhere flashing sheet to substrate in a full application of solvent-free flashing adhesive, extending from within 1/2 inch of the top of the counterflashing to not less than 8 inches onto the membrane. Extend flexts to the top of the curbs. Overlap vertical flashings 4 inches and heat weld vertical laps.
 1. Verify minimum and maximum height limits with manufacturer. NRCA recommends minimum base flashing height of 8 inches and maximum of 24 inches.
 2. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above built-up roofing and 6 inches (150 mm) onto field of built-up roofing.

3. At parapet walls, elastomeric sheeting will extend up and over top of parapet wall and be nailed off to back side.
 4. Install elastomeric sheeting in longest lengths possible, minimizing number of end laps, with all flashing membrane end laps are fully embedded in lap adhesive.
 5. Flashing membranes shall be laid in smooth, with no pockets, wrinkles, buckles, or voids.
 6. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing using capped roofing nails at 8 inches on center.
 - a. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.
 7. Where top of flashing is less than 8 inches above the membrane, seal top of flashing with 2 plies of reinforcing fabric set in manufacturer's recommended adhesive.
- C. Install stripping according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
1. Composition Stripping: Install stripping of not less than 2 roofing membrane ply sheets, setting each ply in a continuous coating in a solid mopping of hot roofing asphalt, and extend onto roofing membrane 6 inches and 8 inches, respectively.
 2. On top of 2-ply stripping, apply a uniform bed of manufacturer's recommended cold-applied bonding material and embed one ply of elastomeric flashing membrane in accordance with manufacturer's requirements. Roll with steel hand roller to eliminate wrinkles and voids. Lap joints 4 inches minimum, and adhere with manufacturer's recommended lap adhesive. Seal edges of flashing to built-up roofing membrane with fabric reinforcing set in manufacturer's recommended adhesive. Install elastomeric flashing in longest lengths possible to minimize number of end laps. Flashing membrane must be laid in smoothly with no pockets, wrinkles, buckles or voids. Care shall be taken to ensure that all flashing membrane end laps are fully embedded in lap adhesive.
 3. Roof Drains: Set 30-by-30-inch lead flashing in bed of asphalt roofing cement on completed roofing membrane. Cover lead flashing with composition stripping, extending a minimum of 8 inches beyond edge of flashing onto field of roofing membrane. Clamp roofing metal flashing and stripping into roof drain clamping ring. On top of 2-ply stripping, apply a uniform bed of manufacturer's recommended cold-applied bonding material and embed one ply of elastomeric flashing membrane in accordance with manufacturer's requirements. Roll with steel hand roller to eliminate wrinkles and voids. Lap joints 4 inches minimum, and adhere with manufacturer's recommended lap adhesive. Seal edges of flashing to built-up roofing membrane with fabric reinforcing set in manufacturer's recommended adhesive. Install elastomeric flashing in longest lengths possible to minimize number of end laps. Flashing membrane must be laid in smoothly with no pockets, wrinkles, buckles or voids. Care shall be taken to ensure that all flashing membrane end laps are fully embedded in lap adhesive. Clamp roofing membrane, lead flashing, and stripping into roof-drain clamping ring.
 - a. Do not allow stripping to cause a dam around the drain. If flashing causes a dam around drain, remove and reinstall drain as required to eliminate ponding. To protect the insulation, install clamping rings over the membrane at the end of each day before leaving site, even if lead flashing and stripping have not been installed

3.11 COLD-APPLIED SURFACING AND COATING INSTALLATION

- A. Prior to application of flood coat, Contractor and manufacturer's representative shall inspect roof. Repair all deficiencies before proceeding.

- B. Prior to application of flood coat, clean and prime roof surfaces that have become contaminated with dirt and/or debris. Prime contaminated areas with low-VOC primer at a rate of 200 to 400 square feet per gallon.
- C. Aggregate Surfacing: After installing and testing roofing, base flashing, and stripping, promptly apply flood coat of surfacing adhesive to roof surface with 5 gallons per 100 square feet of cold-applied flood coat. While flood coat is fluid, cast the following average weight of aggregate in a uniform course, completely covering flood coat:
 - 1. Minimum Aggregate Weight: 250 lb/100 sq. ft. (12.25 kg/sq. m).
 - 2. If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at a rate of 20 lb/100 sq. ft. (1.0 kg/sq. m).
- D. Surfacing Treatment for Flashings where soiled or stained from installation: Apply coating to base flashings according to manufacturer's written instructions, by spray, roller, or other suitable application method to provide a dry film thickness of not less than 20 mils (0.5 mm).

3.12 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads, using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
 - 1. Set walkway pads in additional pour coat of hot roofing asphalt after sweeping away loose aggregate surfacing.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
 - 1. Testing agency shall survey entire roof area for potential leaks according to ASTM E 7877 Electronic Leak Detection (ELD).
- B. Test Cuts: Before flood coating and surfacing, remove test specimens to evaluate problems observed during quality-assurance inspections of built-up roofing as follows:
 - 1. Provide 12 inch by 12 inch test cuts at six locations as directed by Architect.
 - 2. Determine approximate quantities of components within built-up roofing according to ASTM D 3617.
 - 3. Examine test specimens for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
 - 4. Submit test results from independent testing firm.
 - 5. Repair areas where test cuts were made according to roofing manufacturer's written instructions.
- C. Manufacturer's Field Service: Contractor shall engage manufacturer's inspector for a minimum of 9 hours per day for at least three days for every five days worked. Inspector shall be employee of manufacturer for at least five years and shall submit daily field reports to the Construction Manager.

1. Manufacturer's Final Roof Inspection: Upon completion of installation, arrange for manufacturer's representative to inspect installation. Submit inspection report. Notify Architect and Owner 48 hours in advance of inspection.
- D. Repair or remove and replace components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.
 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Inspection Meeting: Roofer and roofing manufacturer's representative shall be present throughout Architect's preliminary and final inspections.
 1. Absence of roofing manufacturer's representative will result in \$500.00 deduct from Roofing Contract per meeting.

3.14 PROTECTING AND CLEANING

- A. Protect built-up roofing from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, and repair or reinstall roofing 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.
- D. Clean all flashings and roofing to provide a clean white surface.

3.15 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 1. Owner: Frederick County Public Schools.
 2. Address: 191 South East Street, Frederick, Maryland.
 3. Building Name/Type: Rock Creek School.
 4. Address: 55B West Frederick Street, Walkersville, Maryland.
 5. Area of Work: All roof areas.
 6. Acceptance Date: _____.
 7. Warranty Period: Two years.
 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be

made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 90 mph;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 51 13

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Formed roof-drainage sheet metal fabrications.
- 2. Formed low-slope roof sheet metal fabrications.
- 3. Formed wall sheet metal fabrications.
- 4. Formed equipment support flashing.

- B. Related Requirements:

- 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
- 2. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

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

1.4 PREINSTALLATION MEETINGS

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

- 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
- 3. Review requirements for insurance and certificates if applicable.
- 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 1. Include plans, elevations, sections, and attachment details.
 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include details of termination points and assemblies.
 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter-flashings, as applicable.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
 12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
 1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 - 1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details, as tested and approved.

1.9 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 extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120. Identify materials with name of fabricator and design approved by FM Approvals.

- D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. 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.
 - 2. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
 - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: 2D (dull, cold rolled).
- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); pre-painted by coil-coating process to comply with ASTM A755/A755M.
 - 1. Surface: Smooth, flat.
 - 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
 - 3. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Henry Company; Blueskin PE200 HT.
 - c. Owens Corning; WeatherLock Metal High Temperature Underlayment.
 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items, as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item, unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
 2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, with maximum lead content of 0.2 percent.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in 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 to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners 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 (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) 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. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.

- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- 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 cited sheet metal standard and by FM Global Property 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. Tin edges to be seamed, form seams, and solder.
- I. 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.
- J. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 - 1. Gutter Profile: Style B according to cited sheet metal standard.
 - 2. Expansion Joints: Butt type with cover plate.
 - 3. Accessories: Wire-ball downspout strainer and valley baffles.
 - 4. Gutters with Girth 16 to 20 Inches (406 to 508 mm): Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
 - 5. Gutters with Girth 21 to 25 Inches (530 to 640 mm): Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch (0.86 mm) thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 1. Fabricated Hanger Style: Fig 1-35B according to SMACNA's "Architectural Sheet Metal Manual."
 - 2. Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- C. Parapet Scuppers: Fabricate welded scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100

mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch (0.48 mm) thick.

- D. Conductor Heads: Fabricate welded conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch (0.86 mm) thick minimum.
2. Stainless Steel: 0.019 inch (0.48 mm) thick.

- E. Splash Pans: Fabricate to dimensions and shape required and from the following materials:

1. Stainless Steel: 0.019 inch (0.48 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
2. Fabricate from the Following Materials:

- a. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

- B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, and solder or weld watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: Fig 3-4A according to SMACNA's "Architectural Sheet Metal Manual."
2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
3. Fabricate from the Following Materials:

- a. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch (1.02 mm) thick.

- C. Roof and Roof-to-Wall Transition Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.

1. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch (0.86 mm) thick.

- D. Base Flashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

- E. Counterflashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

- F. Flashing Receivers: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
- G. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
- H. Roof-Drain Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.016 inch (0.40 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
 1. Stainless Steel: 0.016 inch (0.40 mm) thick.
- B. Opening Flashings in Frame Construction: Fabricate head, jamb, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
 1. Stainless Steel: 0.016 inch (0.40 mm) thick.
- C. Wall Expansion-Joint Cover: Fabricate from the following materials:
 1. Aluminum: 0.040 inch (1.02 mm) thick.
 2. Stainless Steel: 0.019 inch (0.48 mm) thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:
 1. Stainless Steel: 0.025 inch (0.64 mm) thick.
 2. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, 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.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within fourteen (14) days.
- D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 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, 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, levels, and slopes. 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. Run continuous cleats attached not more than 6 inches (150 mm) on center. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws substrate, or not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder aluminum sheet.
 2. Do not use torches for soldering.
 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

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

- B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.
 - 2. Anchor and loosely lock back edge of gutter to continuous cleat.
 - 3. Anchor gutter with gutter brackets spaced not more than 36 inches (910 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
 - 4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
 - 1. Connect downspouts to underground drainage system, unless otherwise indicated.
 - 2. Provide elbows at base of downspout to direct water away from building, where indicated.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.
- E. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- E. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

- F. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- G. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 04 20 00 "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) 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."

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. 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 sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

- E. 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 07 62 00

**SECTION 07 71 00
ROOF SPECIALTIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Copings.
- 2. Roof-edge specialties.
- 3. Roof-edge drainage systems.
- 4. Reglets and counterflashings.

B. Related Requirements:

- 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
- 2. Section 07 51 13 "Built-Up Asphalt Roofing" for warranty for roof specialties.
- 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
- 4. Section 07 71 29 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
- 5. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
- 6. Section 07 92 00 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

C. Preinstallation Conference: Conduct conference at Project site.

- 1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
- 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
- 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 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 roof specialties.
 - 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 4. Detail termination points and assemblies, including fixed points.
 - 5. Include details of special conditions.
- C. Samples: For each type of roof specialty and for each color and texture specified.
- D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- E. Samples for Verification:
 - 1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
 - 2. Include copings roof-edge specialties, roof-edge drainage systems, and reglets and counterflashings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in 07 51 13 "Built-Up Asphalt Roofing".

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 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.

1.9 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section Insert 07 51 13 "Built-Up Asphalt Roofing."
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall 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.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals' Listing: Manufacture and install copings roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- D. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.

- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ATAS International, Inc.
 - b. Berridge Manufacturing Company.
 - c. Cheney Flashing Company.
 - d. Drexel Metals.
 - e. Hickman Company, W. P.
 - f. Merchant and Evans.
 - g. Metal-Era, Inc.
 - h. PAC-CLAD; Petersen Aluminum Corporation.
 2. Metallic-Coated Steel Sheet Coping Caps: Zinc-coated (galvanized) steel, nominal thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.

2.3 ROOF-EDGE SPECIALTIES

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous metal receiver with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Berridge Manufacturing Company.
 - b. Drexel Metals.
 - c. Hickman Company, W. P.
 - d. Metal-Era, Inc.
 - e. OMG Roofing Products.
 2. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel, nominal thickness as required to meet performance requirements.

- a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
 - 3. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
 - 4. Corners: Factory mitered and continuously welded.
 - 5. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 - 6. Receiver: Manufacturer's standard material and thickness.
 - 7. Fascia Accessories: Fascia extenders with continuous hold-down cleats, wall cap, and soffit trim.
- B. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet (3.6 m), with a horizontal flange and vertical leg fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Berridge Manufacturing Company.
 - b. Cheney Flashing Company.
 - c. Drexel Metals.
 - d. Hickman Company, W. P.
 - e. Metal-Era, Inc.
 - f. PAC-CLAD; Petersen Aluminum Corporation.
 - 2. Metallic-Coated Steel Sheet Gravel Stops: Zinc-coated (galvanized) steel, nominal thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
 - 3. Formed Aluminum Sheet Gravel Stops: Aluminum sheet, thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
 - 4. Corners: Factory mitered and continuously welded.
 - 5. Accessories: Fascia extenders with continuous hold-down cleats, wall cap, and soffit trim.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ATAS International, Inc.
 2. Cheney Flashing Company.
 3. Drexel Metals.
 4. Hickman Company, W. P.
 5. Merchant and Evans.
 6. Metal-Era, Inc.
- B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet (3.6 m), with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
1. Zinc-Coated Steel: Nominal thickness as required to meet performance requirements.
 2. Aluminum Sheet: Nominal thickness as required to meet performance requirements.
 3. Gutter Profile: Style B according to SMACNA's "Architectural Sheet Metal Manual."
 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
 5. Gutter Accessories: Wire ball downspout strainer and flat ends.
- C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors. No visible pop rivets.
1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
 2. Formed Aluminum: 0.040 inch (1.02 mm) thick.
- D. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scuppers. Welded construction.
1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
 2. Stainless Steel: 0.019 inch (0.48 mm) thick.
 3. Increase thickness of base metal as required for weldability.
- E. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim, and built-in overflow. Welded construction.
1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
 2. Formed Aluminum: 0.032 inch (0.81 mm) thick.
 3. Stainless Steel: 0.016 inch (0.40 mm) thick.
 4. Increase thickness of base metal as required for weldability.
- F. Splash Pans: Fabricate from the following exposed metal:
1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- G. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
1. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.

- H. Aluminum Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
- I. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished).

2.5 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cheney Flashing Company.
 - 2. Drexel Metals.
 - 3. Fry Reglet Corporation.
 - 4. Heckmann Building Products, Inc.
 - 5. Hickman Company, W. P.
 - 6. Keystone Flashing Company, Inc.
 - 7. Metal-Era, Inc.
 - 8. OMG, Inc.
- B. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m) designed to snap into through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
 - 1. Zinc-Coated Steel: Nominal 0.028-inch (0.71-mm) thickness.
 - 2. Formed Aluminum: 0.032 inch (0.81 mm) thick.
 - 3. Stainless Steel: 0.019 inch (0.48 mm) thick.
- C. Accessories:
 - 1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
 - 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- D. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
- E. Aluminum Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range, up to two (2) colors.
- F. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished).

2.6 MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.7 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc; CCW WIP 300HT.
 - b. GCP Applied Technologies Inc.; Grace Ice and Water Shield HT.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, a Drexel Metals Company; Metshield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
 - 2. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F (116 deg C).
 - 3. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F (29 deg C).
- B. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.8 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 - 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.9 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted 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 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.
- D. Coil-Coated Galvanized-Steel Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A 755/A 755M and coating and resin manufacturers' written instructions.
 - 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.
 - b. Two-Coat Mica Fluoropolymer: AAMA 621. Fluoropolymer finish with suspended mica flakes 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.
 - c. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- E. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. 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.
 - b. Two-Coat Mica Fluoropolymer: AAMA 2605. Fluoropolymer finish with suspended mica flakes 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.
 - c. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
 - 2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

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

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within fourteen (14) days.
 - 1. Apply continuously under copings, roof-edge specialties, and reglets and counterflashings.
 - 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- B. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

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

- D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
 - 1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.
 - 2. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.5 ROOF-EDGE SPECIALITIES INSTALLATION

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

3.6 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches (610 mm) apart, or as required for performance requirements. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install expansion-joint caps.

- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.
 - 1. Connect downspouts to underground drainage system indicated.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement.
- E. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
 - 2. Loosely lock front edge of scupper with conductor head.
 - 3. Seal or solder exterior wall scupper flanges into back of conductor head.
- F. Conductor Heads: Anchor securely to wall with elevation of conductor overflow top edge not less than 1 inch (25 mm) above scupper discharge.

3.7 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches (100 mm) over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

SECTION 07 71 29
MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Flanged bellows-type roof expansion joints.

- B. Related Requirements:

- 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
 - 3. Section 07 72 00 "Roof Accessories" for manufactured and prefabricated metal roof curbs.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

- B. Shop Drawings: For roof expansion joints.

- 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
 - 3. Provide isometric drawings of intersections, terminations, changes in joint direction or planes, and transition to other expansion joint systems depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

- C. Samples: For each exposed product and for each color specified, 6 inches (150 mm) in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

1.6 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Fire-Resistance Rating: Comply with ASTM E1966 or UL 2079; testing by a qualified testing agency to resist the spread of fire and to accommodate building thermal movements without impairing its ability to resist the passage of fire and hot gases. Identify products with appropriate markings of applicable testing agency.
 1. Rating: Not less than 2-hour.
 2. Location: EJ-9 from column L-12 to column N-12 to column N-11.
 3. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 FLANGED BELLOWS-TYPE ROOF EXPANSION JOINTS (EJ-8, EJ-9)

- A. Flanged Bellows-Type Roof Expansion Joint: Factory-fabricated, continuous, waterproof, joint cover consisting of exposed membrane bellows laminated to flexible, closed-cell support foam, and secured along each edge to 3- to 4-inch- (76- to 100-mm-) wide metal flange.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
 - b. Balco, Inc.
 - c. BASF Corp. - Watson Bowman Acme Corp.
 - d. C/S Group.
 - e. Inpro Corporation.
 - f. Johns Manville; a Berkshire Hathaway company.
 - g. MM Systems Corporation.
 - h. Nystrom, Inc.

2. Source Limitations: Obtain flanged bellows-type roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.
3. Joint Movement Capability: Plus and minus 50 percent of joint size.
4. Bellows Membrane: EPDM flexible membrane, nominal **60 mils (1.5 mm)** thick, factory laminated to bellows and covering entire joint assembly and curbs.
 - a. Color: Black.
5. Bellows Support: Manufacturer's closed-cell foam.
6. Flanges: Aluminum, **0.032 inch (0.81 mm)** thick.
7. Configuration: As indicated on Drawings.
 - a. **EJ-8**: Flat to fit cants.
 - b. **EJ-9**: Angle formed to fit wall-to-roof transition.
8. Corner, Intersection, and Transition Units: Provide factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints.
9. Accessories: Provide splicing units, adhesives, and other components as recommended by roof-expansion-joint manufacturer for complete installation.
10. Secondary Seal: Continuous, air-tight and waterproof membrane within joint and attached and sealed to substrate on sides of joint below the primary bellows assembly.
 - a. Thermal Insulation: Fill space above secondary seal with manufacturer's standard, factory-installed mineral-fiber insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84.
11. Fire Barrier: Manufacturer's standard fire barrier for fire-resistance-rated expansion joint system.

B. Materials:

1. Aluminum Sheet: **ASTM B209 (ASTM B209M)**, mill finish, with temper to suit forming operations and performance required.
 - a. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious or preservative-treated wood materials.
2. EPDM Membrane: ASTM D4637/D4637M, type standard with manufacturer for application.

2.3 MISCELLANEOUS MATERIALS

- A. Adhesives: As recommended by roof-expansion-joint manufacturer.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
 1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.
- C. Mineral-Fiber Blanket: ASTM C665.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joint openings, substrates, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing roof expansion joints.
 - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
 - 2. Install roof expansion joints true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 3. Provide for linear thermal expansion of roof expansion joint materials.
 - 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
 - 5. Provide uniform, neat seams.
 - 6. Install roof expansion joints to fit substrates and to result in watertight performance.
- B. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.
- C. Transitions to Other Expansion-Control Joint Assemblies: Coordinate installation of roof expansion joints with other exterior expansion-control joint assemblies specified in Section 07 95 13.16 "Exterior Expansion Joint Cover Assemblies" and Section 07 91 00 "Preformed Joint Seals" to result in watertight performance. Install factory-fabricated units at transitions between roof expansion joints and exterior expansion-control joint systems.
- D. Splices: Splice roof expansion joints to provide continuous, uninterrupted, and waterproof joints.
 - 1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- E. Fire Barrier: Install fire barrier, as required by manufacturer, to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.
- F. 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.

END OF SECTION 07 71 29

**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof curbs.
 - 2. Equipment supports.
 - 3. Preformed flashing sleeves.
- B. Related Sections:
 - 1. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 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.

1.4 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall 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.

2.2 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, stepped integral metal cant raised the thickness of roof insulation, 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. Curbs Plus, Inc.
 - b. Greenheck Fan Corporation.
 - c. LMCurbs.
 - d. Pate Company (The).
 - e. Roof Products, Inc.
 - f. Thybar Corporation.
 - g. Vent Products Co., Inc.
 - h. Manufacturer recommending in writing by rooftop equipment manufacturer, as acceptable to roofing manufacturer.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: As required by supported equipment, including safety factors, plus 25 percent.
- D. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch (2.01 mm) thick.
 - 1. Finish: Factory prime coating.
- E. Construction:
 - 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 - 2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - 3. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
 - 4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
 - 5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.

6. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber or polyisocyanurate board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
9. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed structure-mounting flange at bottom.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Curbs Plus, Inc.
 - b. Greenheck Fan Corporation.
 - c. LMCurbs.
 - d. Pate Company (The).
 - e. Roof Products, Inc.
 - f. Thybar Corporation.
 - g. Vent Products Co., Inc.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch (2.01 mm) thick.
 1. Finish: Factory prime coating.
- D. Construction:
 1. Curb Profile: Manufacturer's standard compatible with roofing system.
 2. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
 3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
 4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches (90 mm) wide on top flange of equipment supports, continuous around support perimeter.
 5. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch (19-mm) thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 6. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
 7. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 8. Fabricate equipment supports to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.

2.4 PREFORMED FLASHING SLEEVES

- A. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Solution Roof and Metal Products.
 - b. Miclor, Inc., Commercial Products Group of Hart & Cooley, Inc.
 - c. Thaler Metal USA, Inc.
 2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
 3. Height: As indicated.
 4. Diameter: As indicated on Drawings.
 5. Finish: Manufacturer's standard.

2.5 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting where indicated.
1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
1. Mill Finish: As manufactured.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
 3. 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 (0.013 mm).
- C. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.
- E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- F. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- G. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Glass-Fiber Board Insulation: ASTM C 726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.
- C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for above ground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Underlayment:
 - 1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
- G. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- I. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant, as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- J. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. 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.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

- A. General: 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 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. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.
- F. Seal joints with elastomeric sealant, as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 84 13
PENETRATION FIRESTOPPING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated walls, horizontal assemblies and smoke barriers including both empty openings and openings containing penetrating items.
- B. 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.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Applicable Codes:
 - 1. International Building Code: Current approved edition per AHJ
 - 2. NFPA 101 Life Safety Code: Current approved edition per AHJ

1.3 DEFINITIONS

- Firestopping:** A process whereby materials are used to resist (or stop) the spread of fire and its byproducts through openings made to accommodate penetrations in fire-rated walls, floors and floor/ceiling assemblies. Typical firestopping system comprised of 3 components: Wall or floor; Penetrating item; and, Firestopping material.
- Assembly:** A wall, floor, or other partition. It may include such things as receptacles, outlet boxes, recessed lighting fixtures, or penetrations.
- System:** The combination of the assembly, the penetrant(s), and the firestop materials. All of these items, together, constitute the system, and the system is the only basis for the classification.
- Intumescent:** A class or type of firestop materials that will swell or expand upon exposure to elevated temperatures. Material will also form an insulating char.
- Fire Barrier:** A fire resistance rated vertical or horizontal assembly of materials designed to restrict the spread of fire in which openings are protected.
- Fire Wall:** A wall separating buildings or subdividing a building to prevent the spread of fire and having a fire resistance rating. Fire walls are structurally stable such that collapse of construction on either side will not cause the wall to collapse.
- Smoke Barrier:** A continuous membrane, either vertical or horizontal, that is designed and constructed to restrict the movement of smoke.

Engineering Judgements:

- A. Engineering judgements (EJ's) are used when a tested, UL classified system is not available.
- B. The EJ is based on existing technology and available tested systems.
- C. EJ's must be conducted by the manufacturer's technical or engineering group. The installing contractor cannot write their own EJ!
- D. A third-party review of the EJ is required.

- E. EJ's can only be applied to the specific application for which they were written.

Qualified Contractor Programs:

This category covers Contractor firms who have demonstrated knowledge and a comprehensive management system that specifically focus on the selection and installation of firestop systems or spray-applied fire-resistive materials (SFRMs). The audited Contractor firm systems under UL's Qualified Contractor Programs provide an integrated approach to controlling the processes in addressing architectural, Authorities Having Jurisdiction and customer requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following 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.
 - 1. Fire-resistance-rated walls including fire walls.
 - 2. Fire-resistance-rated horizontal assemblies including floors.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equal or exceed 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 wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
- 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 piping penetrations for plumbing, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. 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 E 84.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated from single manufacturer.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency. See UL Directory or FM Global.
- 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.
 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. A third-party review of the Engineering Judgement is required.
- D. Qualification Data: For a single source qualified Installer.
- E. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- 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: Penetration firestopping shall comply with the following requirements:
1. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 1. UL in its "Fire Resistance Directory."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration fire-stop 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 change, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. Hilti Construction Chemicals Division of Hilti Inc.
 - 2. Specified Technologies Inc.
 - 3. 3M Fire Protection Products.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is 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. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. Horizontal assemblies include floors.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

2.3 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. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.

- b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
- c. Fire-rated form board.
- d. Fillers for sealants.
- 2. Temporary forming materials.
- 3. Substrate primers.
- 4. Collars.
- 5. Steel sleeves.

2.4 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. 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 non-shrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.

2.5 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system 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

3.1 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 the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with 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 penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by 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 penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact, or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming 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 firestopping.
- C. Install fill materials for firestopping 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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE - Note that the following schedule is to be used as a guide only and is not intended to include every solution that may be required due to field conditions. See UL listings for system details and applicability. Additional or alternative systems shall be proposed by the contractor as required to satisfy field conditions in order to maintain specified fire ratings. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

- A. Firestop Systems with No Penetrating Items (for circular openings in concrete floors or CMU walls to 6-inch diameter):
 - 1. UL-Classified Systems: C-AJ-0060.
- B. Firestop Systems with No Penetrating Items (for square or rectangular openings in concrete slabs or CMU walls of up to 36 square feet):
 - 1. UL-Classified Systems: C-AJ-0004.
- C. Firestop Systems for Insulated Ducts:
 - 1. UL-Classified Systems (CMU walls): W-J-7030 or W-J-7114.
 - 2. UL-Classified Systems (framed gypsum walls): W-J-7051 or W-J-7195.
- D. Firestop Systems for Combination Penetrations:
 - 1. UL-Classified Systems (concrete slab or CMU walls): C-AJ-8087, C-AJ-8088, C-AJ-8123, or C-AJ-8135.
 - 2. UL-Classified Systems (framed gypsum walls): C-AJ-8018, C-AJ-8021, or C-AJ-8039.
- E. Firestop Systems for Metallic Pipes, Conduit, or Tubing:
 - 1. UL-Classified Systems (concrete slab or CMU walls): C-AJ-1001, C-AJ-1427, or C-AJ-1551.
 - 2. UL-Classified Systems (framed gypsum walls): W-L-1003 or W-L-1296.
- F. Firestop Systems for Multiple Metallic Pipes, Conduit, or Tubing:
 - 1. UL-Classified Systems (concrete slab or CMU walls): C-AJ-1429.
 - 2. UL-Classified Systems (framed gypsum walls): W-L-1287.
- G. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing:
 - 1. UL-Classified Systems: (concrete slab or CMU walls): C-AJ-2001.
 - 2. UL-Classified Systems (framed gypsum walls): W-L-2162.
- H. Firestop Systems for Insulated Pipes:
 - 1. UL-Classified Systems (concrete slab or CMU walls):
 - a. Insulated Metal Pipe: C-AJ-8072.
 - b. Glass Fiber Insulated Metal Pipe: C-AJ-5210.
 - c. Insulated Metal Pipe (AB/PVC Flexible Foam): C-AJ-5211.
 - 2. UL-Classified Systems (framed gypsum walls):
 - a. Insulated Metal Pipe: W-L-5011 or W-L-8010.
 - b. Glass Fiber Insulated Metal Pipe: W-L-5168.
 - c. Insulated Metal Pipe (AB/PVC Flexible Foam): W-L-5169.

- I. Firestop Systems for Electrical Cables:
 - 1. UL-Classified Systems (concrete slab or CMU walls): C-AJ-3021 or C-AJ-3310.
 - 2. UL-Classified Systems (framed gypsum walls): W-L-3347 or W-L-3371.
- J. Firestop Systems for Insulated Electrical Cables via Device:
 - 1. UL-Classified Systems (concrete slab or CMU walls): C-AJ-3250.
 - 2. UL-Classified Systems (framed gypsum walls): W-L-3289.
- K. Firestop Systems for Cable Trays:
 - 1. UL-Classified Systems (framed gypsum walls): W-L-4037.
- L. Firestop Systems for Multiple Conduit:
 - 1. UL-Classified Systems (framed gypsum walls): W-L-1228 or W-L-1255.

- END OF SECTION 07 84 13-

**SECTION 07 84 43
JOINT FIRESTOPPING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Joints in or between fire-resistance-rated constructions.

- B. Related Requirements:

- 1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
 - 2. Section 07 95 13.13 "Interior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.

1.3 ACTION SUBMITTALS

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

- B. LEED Submittals: Comply with Section 01 81 13.

- 1. MR Credit 2: BPDO – Environmental Product Declarations

- a. For firestopping materials, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.

- 2. MR Credit 4: BPDO – Material Ingredients

- a. For firestopping materials, if available: Material Ingredient Report.

- 3. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

- 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system

manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."

2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
 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. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. ROCKWOOL (ROXUL Inc.).
 - d. Thermafiber, Inc.; an Owens Corning company.
 - e. Tremco, Inc.
 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping 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.

3.3 INSTALLATION

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

3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

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

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Performance:
 - 1. Assembly Rating: 1 hour and 2 hours, as indicated on Drawings.
 - 2. L-Rating at Ambient and Elevated Temperature: Less than 5 cfm/ft. (0.00775cu. m/s x m) at 0.30 inch water (7.47 Pa)
- C. Wall-to-Wall, Joint Firestopping Systems:
 - 1. UL-Classified Systems: WW- S- 0000-0999.
- D. Floor-to-Wall, Joint Firestopping Systems:
 - 1. UL-Classified Systems: FW-D- 0000-1999.
 - 2. Movement Capabilities: Class II – 50 percent compression or extension compression, extension, or horizontal shear.
- E. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:
 - 1. UL-Classified Systems: HW-D-- 0000-1999.
 - 2. Movement Capabilities: Class II – 50 percent compression or extension.
- F. Bottom-of-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: BW-S- 0000-0999.

END OF SECTION 07 84 43

**SECTION 07 91 00
PREFORMED JOINT SEALS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Preformed, foam joint seals.
- B. Related Requirements:
 - 1. Section 07 95 13.13 "Interior Expansion Joint Cover Assemblies."

1.3 ACTION SUBMITTALS

- A. Product Data: For each preformed joint seal product.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of preformed joint seal required, provide Samples with joint seals in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint seals.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each preformed joint seal for tests performed by manufacturer and witnessed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 PREFORMED, FOAM JOINT SEALS

- A. Preformed, Foam Joint Seals (**EJ-1**): Manufacturer's standard joint seal manufactured from procured silicon with urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) 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. Basis-of-Design Product: Subject to compliance with requirements, provide MM Systems Corporation; ESS-200 or a comparable product by one of the following:
 - a. Construction Specialties.
 - b. EMSEAL Joint Systems, Ltd.
 - c. Inpro Corporation.
 - d. Nystrom, Inc.
 - e. Sandell Manufacturing Co., Inc.
2. Design Criteria:
 - a. Nominal Joint Width: 2 inches.
 - b. Minimum Joint Width: 1 inch.
 - c. Maximum Joint Width: 3 inches.
 - d. Movement Capability: +/- 50 percent.
3. Joint Seal Color: As selected by Architect from full range of industry colors.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal 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 optimal bond with preformed joint seals. 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.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 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 seals. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

- A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Installation of Preformed, Foam Joint Seals:
1. Install each length of seal immediately after removing protective wrapping.
 2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive, as recommended by manufacturer.
 3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
 4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

3.4 PROTECTION

- A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals 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 seals immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 91 00

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Requirements:

- 1. Section 03 15 00 "Concrete Accessories" for joints in concrete slabs.
- 2. Section 07 91 00 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
- 3. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in acoustically rated assemblies.
- 4. Section 09 30 13 "Ceramic Tiling" for sealing tile joints.
- 5. Section 09 51 113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.
- 6. Section 32 13 73 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. LEED Submittals: Comply with Section 01 81 13.

- 1. MR Credit 4: BPDO – Material Ingredients.
 - a. For sealants, if available: Material Ingredient Report.
- 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. 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.
- C. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- E. Field-Adhesion-Test Reports: For each sealant application tested.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone and masonry substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 - 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than twenty-four (24) months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each kind of sealant and joint substrate.
 - 3. Notify Architect seven (7) days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 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.
 - 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 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 (5 deg C).
 - 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.

1.8 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 (2) 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: Ten (10) years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. LEED Requirements:
 - 1. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
 - 2. Prohibit Methylene chloride and perchloroethylene in sealants.
- B. 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.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

- a. Dow Corning Corporation.
- b. Pecora Corporation; 860.
- c. Sika Corporation; Joint Sealants; Sikasil-GP.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

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

- a. Dow Corning Corporation; Dow Corning® 795 Silicone Building Sealant.
- b. Pecora Corporation; 864NST.
- c. Sika Corporation; Joint Sealants; Sikasil WS-295.
- d. Tremco Incorporated; Spectrem 3.

2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

- a. Pecora Corporation; Dynatrol I-XL.
- b. Polymeric Systems, Inc.; Flexiprene 1000.
- c. Sika Corporation; Joint Sealants; Sikaflex Textured Sealant.
- d. Tremco Incorporated; Dymonic.

- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

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

- a. BASF Corporation; Construction Systems; MasterSeal SL 1 (Pre-2014: Sonolastic SL1).
- b. Pecora Corporation; NR-201.
- c. Polymeric Systems, Inc.; Flexiprene 952.
- d. Sherwin-Williams Company (The); Stampede 1SL.

- C. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.

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

- a. Pecora Corporation; DynaTrol II.
- b. Tremco Incorporated; Vulkhem 445SSL.

2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

- a. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
- b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
- c. Pecora Corporation; 898NST.
- d. Tremco Incorporated; Tremsil 200.

2.6 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

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

- a. Bostik, Inc.; Chem-Calk 300.
- b. Pecora Corporation; BC-158.

2.7 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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

- a. Pecora Corporation; AC-20.
- b. Sherwin-Williams Company (The); 950A Siliconized Acrylic Latex Caulk, White.
- c. Tremco Incorporated; Tremflex 834.

2.8 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.

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) 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.

2.9 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

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions 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.
 - c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform ten (10) tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform one (1) test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. 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.
3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. 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.
4. 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.
5. 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.

B. 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.

3.5 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.

3.6 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.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Joints between plant-precast architectural concrete paving units.
 - c. Joints between sidewalks and building.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, M, P, 50, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Joints in glass unit masonry assemblies.
 - f. Joints between metal panels.
 - g. Joints between different materials listed above.
 - h. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - i. Control and expansion joints in ceilings and other overhead surfaces.
 - j. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.

- b. Control and expansion joints in tile flooring (other than ceramic tile).
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical joints on exposed surfaces of unit masonry walls and partitions.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Urethane, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - b. Drywall inside corners.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Concealed mastics.
 - 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Butyl-rubber based.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 07 92 19
ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 4: BPDO – Material Ingredients.
 - a. For sealants, if available: Material Ingredient Report.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Acoustical-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
 - 2. Prohibit Methylene chloride and perchloroethylene in sealants.
- B. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 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. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant.
 - b. Pecora Corporation; AC-20 FTR.
 - c. Serious Energy Inc.; Quiet Seal Pro.
 - d. United States Gypsum Company; SHEETROCK Acoustical Sealant.
 - 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

- 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

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical 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.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 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 acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical 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 acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 19

SECTION 07 95 13.13
INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes interior expansion joint cover assemblies.
- B. Related Requirements:
 - 1. Section 07 91 00 "Preformed Joint Seals."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.
- B. Shop Drawings: For each expansion joint cover assembly.
 - 1. Plan showing locations, types, and fire ratings of each expansion joint.
 - 2. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
 - 3. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components, including fire barriers, interconnect.
- C. Samples for Initial Selection: For each type of exposed finish.
 - 1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric-seal material.
- D. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches (150 mm) long in size.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.

- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.
- C. Manufacturers: Subject to compliance with requirements, provide basis-of-design product by MM Systems Corporation, or comparable product by one of the following:
 - 1. Construction Specialties, Inc.
 - 2. Inpro Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.
 - 2. Where expansion joint assemblies cross fire walls and fire barriers, provide two-hour fire rated expansion joint assemblies.
 - 3. Locations:
 - a. Two hours: EJ-3 south of opening 022/2:
 - b. Smoke Partitions: Provide material, acceptable to authority having jurisdiction, to resist passage of smoke.
- B. Expansion Joint Design Criteria:
 - 1. Type of Movement
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Minimum Joint Width: As indicated on Drawings.
 - c. Maximum Joint Width: As indicated on Drawings.

2.3 WALL EXPANSION JOINT COVERS

- A. Metal-Plate Wall Joint Cover (**EJ-2**): Metal cover plate fixed on one side of joint gap and free to slide on other.
 - 1. Basis-of-Design: MM Systems; EX-K2.
 - 2. Application: Wall to wall (CMU).
 - 3. Fire-Resistance Rating: Not less than that indicated on Drawings.
 - 4. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.
- B. Metal-Plate Wall Joint Cover (**EJ-3**): Metal cover plate fixed on one side of joint gap and free to slide on other.
 - 1. Basis-of-Design: MM Systems; EX-L2
 - 2. Application: Wall to corner (CMU or GWB).
 - 3. Fire-Resistance Rating: Not less than that indicated on Drawings.
 - 4. Exposed Metal:

- a. Aluminum: Clear anodic, Class II.
- C. Metal-Plate Wall Joint Cover (**EJ-4**): Metal cover plate fixed on both sides of joint gap and with plate free to slide between covers.
 - 1. Basis-of-Design: MM Systems; FX-K-2-1.
 - 2. Application: Wall to wall (GWB).
 - 3. Fire-Resistance Rating: Not less than that indicated on Drawings.
 - 4. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.

2.4 CEILING EXPANSION JOINT COVERS

- A. Elastomeric-Seal Ceiling Joint Cover (**EJ-5**): Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.
 - 1. Basis-of-Design: MM Systems; VSWL-200.
 - 2. Application: Wall to ceiling (GWB).
 - 3. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.
 - 4. Seal: Preformed elastomeric membranes or extrusions.
- B. Elastomeric-Seal Ceiling Joint Cover (**EJ-6**): Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.
 - 1. Basis-of-Design: MM Systems; VSW-200.
 - 2. Application: Ceiling to ceiling (GWB).
 - 3. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.
 - 4. Seal: Preformed elastomeric membranes or extrusions.
 - a. Color: As selected by Architect from manufacturer's full range.
- C. Elastomeric-Seal Ceiling Joint Cover (**EJ-7**): Elastomeric-seal assembly designed for use in acoustical ceilings and fixed to one side of joint gap.
 - 1. Basis-of-Design: MM Systems; VSGL-200.
 - 2. Application: Wall to ceiling (acoustical ceiling).
 - 3. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.
 - 4. Seal: Preformed elastomeric membranes or extrusions.
 - a. Color: As selected by Architect from manufacturer's full range.
- D. Elastomeric-Seal Ceiling Joint Cover (**EJ-10**): Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.

1. Basis-of-Design: MM Systems; VSWL-200.
2. Application: Wall to ceiling (GWB).
3. Exposed Metal:
 - a. Aluminum: Clear anodic, Class II.
4. Seal: Preformed elastomeric membranes or extrusions.
 - a. Color: As selected by Architect from manufacturer's full range.

2.5 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304 for plates, sheet, and strips.
- C. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.
- D. Fire Barriers: Manufacturer's standard material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.
 1. Basis-of-Design: MM Systems; PyroFlex Wall to Wall / PF Series.

2.6 ALUMINUM FINISHES

- A. Mill finish.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.7 ACCESSORIES

- A. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.
- B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

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

3.2 PREPARATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 - 2. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
 - 5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints, as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape, as recommended by manufacturer.
- D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.
- E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
- A. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint in exposed and concealed areas, including transitions, and field splices.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION 07 95 13.13

**SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.
- B. Related Requirements:
 - 1. Section 08 34 73.13 "Metal Sound Control Door Assemblies" for metal doors and frames with acoustical ratings.
 - 2. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation 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. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

- B. LEED Submittals: Comply with Section 01 81 13.
1. MR Credit 2: BPDO – Environmental Product Declarations.
 - a. For steel doors, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 3: BPDO – Sourcing of Raw Materials.
 - a. For recycled content steel or aluminum: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 3. MR Credit 4: BPDO – Material Ingredients.
 - a. For doors, if available: Material Ingredient Report.
- C. Shop Drawings: Include the following:
1. Elevations of each door type.
 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 each different wall opening condition.
 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 7. Details of anchorages, joints, field splices, and connections.
 8. Details of accessories.
 9. Details of moldings, removable stops, and glazing.
- D. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.
- E. Samples for Verification:
1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
- F. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

- B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.

1.8 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAl) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAl) certification.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. Republic Doors and Frames.
 - 4. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. LEED Requirements:

1. Recycled Content: Provide steel and aluminum with minimum 25 percent post-consumer recycled content.

B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. Temperature-Rise Limit: At vertical exit enclosures 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.

C. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

D. Thermally Rated Door and Frame Assemblies: Provide door and frame assemblies with U-factor of not more than 0.45 deg Btu/F x h x sq. ft. (2.72 W/K x sq. m) when tested according to ASTM C 518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES ("HM")

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
3. Exposed Finish: Prime.

C. Extra-Heavy-Duty Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Frames:

- a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded.
- 3. Exposed Finish: Prime.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors: SDI A250.8, Level 3.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Polyurethane.
 - 3. Exposed Finish: Prime.
- C. Maximum-Duty Frames: SDI A250.8, Level 4.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.7 mm), with minimum A40 (ZF120) coating.
 - b. Construction: Face welded.
 - c. Thermally broken.
 - 3. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
- B. Construction: Face welded.
- C. Fabricate in one (1) piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.7 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one (1) additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.8 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. 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 hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.9 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors, where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite 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 welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.10 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Fire-Rated Openings: Install frames according to NFPA 80.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors, if so indicated and approved on Shop Drawings.
 - 4. Solidly pack mineral-fiber insulation inside frames.
 - 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.

- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
 - 2. 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 according to NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 11 13

**SECTION 08 14 16
FLUSH WOOD DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
- B. Related Requirements:
 - 1. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations.
 - a. For wood doors, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials.
 - a. For wood doors having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For certified wood doors: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For wood doors, if available: Material Ingredient Report.

4. EQ Credit 2: Low-Emitting Materials

- a. For composite wood doors: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three (3) Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Provide Samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.5 QUALITY ASSURANCE

- A. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: 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 ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: 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 between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

- A. 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. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Eggers Industries.
 - 2. Masonite Architectural; Aspiro Series.
 - 3. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. LEED Requirements:

1. Recycled Content: Provide composite wood door cores with minimum 80 percent recycled content.
2. Composite wood doors: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/MI's "Architectural Woodwork Standards."

1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Performance Grade:

1. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated on Drawings.
2. ANSI/WDMA I.S. 1A Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, and exits.
3. ANSI/WDMA I.S. 1A Standard Duty: Closets (not including janitor's closets) and private toilets.

C. 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 positive pressure according to NFPA 252 or UL 10C.

1. Temperature-Rise Limit: At vertical exit enclosures 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.
2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
4. 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.
5. Pairs: Provide formed-steel edges and astragals with intumescent seals.
 - a. Finish steel edges and astragals with baked enamel same color as doors.
 - b. Finish steel edges and astragals to match door hardware (locksets or exit devices).

D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

E. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors, as needed to eliminate through-bolting hardware.
3. Provide doors with glued-wood-stave cores instead of particleboard cores for doors indicated to receive exit devices.

F. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - a. Screw-Holding Capability: 550 lbf (2440 N) per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors (**SCWD**):

1. Architectural Woodwork Standards Grade: Premium.
2. Species: White oak.
3. Cut: Rift cut.
4. Match between Veneer Leaves: Slip match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet (6 m) or more.
8. Exposed Vertical Edges: Same species as faces or a compatible species - edge Type A.
9. Core: Particleboard
 - a. Core in doors over 40% of face cut-out for lites or louvers: Engineered composite lumber.
 - b. Core in doors with exit devices: Glued wood stave.
 - c. Core in fire-rated doors, where required: Mineral-core.
10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Species compatible with door faces.
2. Profile: Manufacturer's standard shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

- C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. 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. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Premium.
 - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 9, UV curable, acrylated epoxy, polyester, or urethane, or System 10, UV curable, water based.

3. Staining: None required.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - b. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- 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.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 2. 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.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 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 08 14 16

**SECTION 08 16 13
FIBERGLASS DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fiberglass reinforced polyester (FRP) flush and vision panel doors with aluminum frames.
- B. Related Requirements:
 - 1. Section 08 41 13.13 "Fire-Rated Aluminum-Framed Entrances and Storefronts" for frames in rated construction.
 - 2. Section 08 80 00 "Glazing" for glass view panels in FRP doors.
 - 3. Section 08 71 00 "Door Hardware" for hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.
- B. LEED Submittals:
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content aluminum doors: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. Product data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include statement indicating cost of each product with recycled content.
 - 3. Product data for Credit EQ 4.1: For adhesives and sealants applied within the building water proofing envelope, documentation including printed statement of VOC content in g/L.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Doors to be factory finished and finish requirements.

D. Samples for Initial Selection:

1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
2. Color: Submit manufacturer's samples of standard colors of doors and frames.

1.4 INFORMATIONAL SUBMITTALS

- A. Quality Standard Compliance Certificates: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- B. Field quality-control reports.
- C. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer. Mark each door on top and bottom rail with opening number used on Shop Drawings.
- C. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- D. Handling: Protect materials and finish from damage during handling and installation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: 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 ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.8 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. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Exterior Doors: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements provide products by Special-Lite, Inc., or a comparable product by one of the following:
 - 1. Capitol Aluminum & Glass Corp.
 - 2. Curries.
 - 3. Cline Aluminum Doors, Inc.
 - 4. Kawneer Co. Inc.
 - 5. Manko Window Systems, Inc.
 - 6. Tiger Door FRP by Overly Door Company.
- B. Source Limitations: Obtain FRP doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Quality Standard: In addition to requirements specified, comply with the following,
 - 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of twenty-five (25) years successful experience.
 - 2. Door and frame components from same manufacturer.
 - 3. Evidence of a compliant documented quality management system.
- C. Fire-Rated Fiberglass 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 positive pressure according to NFPA 252 or UL 10C.
 - 1. Cores: Provide core as needed to provide fire-protection rating indicated.

2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 3. 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.
- D. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
1. Flame Spread: Maximum of 200, Class C.
 2. Smoke Developed: Maximum of 450, Class C.
- E. Surface Burning Characteristics, Class A Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
1. Flame Spread: Maximum of 25.
 2. Smoke Developed: Maximum of 450.
- F. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
- G. Air Infiltration: Not to exceed 0.20 cfm/ft² at pressure differential of 1.57 psf or 0.30 cfm/ft² at pressure differential of 6.27 psf tested in accordance with AAMA/WSDA/CSA101/I.S.2/A440 or NFRC 400.
- H. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
- I. Sound Transmission, Exterior Doors, STC, ASTM E 90: Minimum of 25.
- J. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.32 BTU/hr x sf x degrees F. Minimum of 55 CRF value.
- K. Physical Performance:
1. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256
 2. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638
 3. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790
 4. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570
 5. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583
 6. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420
 7. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel
 8. Stain Resistance, ASTM D 1308: Face sheet shall be unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.
 9. Chemical Resistance, ASTM D 543.
 - a. Acetic acid, Concentrated.
 - b. Ammonium Hydroxide, Concentrated.
 - c. Bleach solution.
 - d. Citric Acid, 10%
 - e. Detergent Solution.
 - f. Ethyl Acetate.
 - g. Formaldehyde.
 - h. Heptane.

- i. Hydrochloric Acid, 10%.
 - j. Hydrogen peroxide, 3%.
 - k. Isooctane.
 - l. Lactic acid, 10%.
 - m. Sodium hypochlorite, 4 to 6 percent solution.
- 10. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621
 - 11. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621
 - 12. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623
 - 13. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126

2.3 FRP FLUSH DOORS

- A. Interior and Exterior Doors with fiberglass reinforced polyester (FRP) face sheets. Basis-of - Design product: Special-Lite, Inc.; Model SL-20.

1. Construction:

- a. Door Thickness: 1-3/4 inches.
- b. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.
- c. Corners: Mitered.
- d. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
- e. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
- f. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
- g. Rail caps or other face sheet capture methods are not acceptable.
- h. Extrude top and bottom rail legs for interlocking continuous weather bar.
- i. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
- j. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
- k. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.

2. Face Sheet:

- a. Material: Exterior grade UV resistant FRP, 0.120-inch thickness, finish color throughout.
- b. Texture: Sandstone.
- c. Color: Custom color to match exterior door paint color.
- d. Adhesion: Use of glue to bond sheet to core or extrusions is not acceptable.

3. Core:

- a. Material: Poured-in-place polyurethane foam.
- b. Density: Minimum of 5 pounds per cubic foot.
- c. R-Value: Minimum of 9.

4. Cutouts:

- a. Manufacture doors with cutouts for required vision lites, louvers, and panels.
 - b. Factory install vision lites, louvers, and panels.
- 5. Hardware:
 - a. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
 - b. Factory install hardware to greatest extent possible.
- B. Interior Fire-Rated Doors with fiberglass reinforced polyester (FRP) face sheets. Basis-of - Design product: Special-Lite, Inc.; SL-20FR.
 - 1. Construction:
 - a. Door Thickness: 1-7/8 inches.
 - b. Stiles and Rails: Manufacturer's standard, minimum of 2-inch depth.
 - c. Continuous Perimeter Edge Channel: 0.062 inch thick stainless steel, 3/4 inch leg, with fire sealant.
 - 2. Face Sheet:
 - a. Material: Exterior grade UV resistant FRP, 0.120-inch thickness, finish color throughout.
 - b. Texture: Wood grain.
 - c. Color: As selected by Architect from manufacturer's full range.
 - d. Adhesion: Use of glue to bond sheet to core or extrusions is not acceptable.
 - 3. Core:
 - a. Material: Manufacturer's standard fire-resistant core.
 - b. Density: Minimum of 18 pounds per cubic foot.
 - 4. Cutouts:
 - a. Manufacture doors with cutouts for required vision lites and panels.
 - b. Provide manufacturer's standard stainless steel lite kit.
 - 5. Hardware:
 - a. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
 - b. Factory install hardware to greatest extent possible.

2.4 ALUMINUM FRAMES

- A. General: Aluminum extrusions closed on all four sides, assembled in screw spline method.
 - 1. Material: 6063-T6 with fiberglass pultrusion thermal struct and pocket filler.
 - a. Wall Thickness: 0.080 inch minimum.
 - b. Wall Thickness at lock and hinge jambs and door headers: 0.125 inch minimum.
 - 2. Glazing Gaskets: Installed in captive assembly of glazing stops.

- a. EPDM: ASTM D 2000.
 - b. Closed-cell foam: ASTM D 1667.
- B. Exterior Aluminum Frames: Basis-of-Design Special-Lite, Inc.; Model SL-600TB Thermally Broken Framing.
 - 1. Size: 2 by 6 inches.
- C. Interior Aluminum Frames: Basis-of-Design Special-Lite, Inc.; Model SL-45FG Framing.
 - 1. Size: 1-3/4 by 4-1/2 inches.
- D. Fire-rated Frames: Provide frames per Section 08 41 13.13 "Fire-Rated Aluminum-Framed Entrances and Storefronts."

2.5 MATERIALS

- A. Aluminum Members:
 - 1. Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes: ASTM B 221.
 - 2. Sheet and Plate: ASTM B 209.
 - 3. Alloy and Temper: As required by manufacturer for strength, corrosion resistance, application of required finish, and control of color.
- B. Components: Door and frame components from same manufacturer.
- C. Fasteners:
 - 1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
 - 2. Compatibility: Compatible with items to be fastened.
 - 3. Exposed Fasteners: Screws with finish matching items to be fastened.

2.6 FABRICATION

- A. Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on the Drawings.
- B. Comply with NFPA 80 requirements for fire-rated doors.
- C. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.
- D. Assembly:
 - 1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
 - 2. Remove burrs from cut edges.
- E. Welding: Welding of doors or frames is not acceptable.
- F. Fit:
 - 1. Maintain continuity of line and accurate relation of planes and angles.

2. Secure attachments and support at mechanical joints with hairline fit at contacting members.
3. Assemble frames with hairline butt joint appearance.

2.7 ALUMINUM FINISHING

- A. Anodized Finish: Class I finish, 0.7 mils thick.
 1. Clear 215 R1, AA-M10C12C22A41.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware".
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - b. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Separate aluminum from other metal surfaces with heavy coating of bituminous paint or other means approved by Architect.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 2. 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.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 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.

3.5 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 16 13

**SECTION 08 33 13
COILING COUNTER DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Counter doors.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. Include description of automatic closing device and testing and resetting instructions.
- B. LEED Submittals:
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials.
 - a. For recycled content doors: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
- D. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two (2) hours normal travel time from Installer's place of business to Project site.
- B. Source Limitations: Provide products from same manufacturer and vendor as Work specified in Section 08 33 23 "Overhead Coiling Doors."

PART 2 - PRODUCTS

2.1 COUNTER DOOR ASSEMBLY (**CS-#**)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide McKeon Rolling Steel Door Company, Inc.; CS3000-PP-SS or a comparable product by one of the following:
 - 1. Clopay Building Products.
 - 2. Cookson Company.
 - 3. Cornell Iron Works, Inc.
 - 4. Lawrence Roll-Up Doors, Inc.
 - 5. Overhead Door Company.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Door Curtain Material: Stainless steel.
- D. Door Curtain Slats: Flat profile slats of 1-1/4-inch (32-mm) center-to-center height.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match slats.
- F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.
- G. Hood: Match curtain material and finish.
 - 1. Shape: Square.

2. Mounting: Face of wall.

H. Sill Configuration:

1. School Store 300: Solid surface sill provide by Casework Contractor.
2. Dishwash 504: Stainless steel sill provided by Kitchen Equipment Contractor.

I. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.

J. Manual Door Operator: Push-up operation.

K. Door Finish:

1. Stainless-Steel Finish: No. 4 (polished directional satin).
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Stainless-Steel Door Curtain Slats: ASTM A 666, Type 304; sheet thickness of 0.025 inch (0.64 mm); and as required.
2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.3 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets, as required to prevent sagging.

1. Stainless Steel: Type 304, complying with ASTM A 666.

2.4 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders specified in Section 08 71 00 "Door Hardware".

2.5 CURTAIN ACCESSORIES

- A. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- B. Pull-Down: Provide one of the following for doors with heads over 84 inches above adjacent finished floor:
 - 1. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches (2130 mm) high.

2.6 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.7 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf (111 N).

2.8 GENERAL FINISH REQUIREMENTS

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

2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 STARTUP SERVICE

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

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts, as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 24 months full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

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

END OF SECTION 08 33 13

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulated service doors.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. LEED Submittals:
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content doors: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
 - 5. Show locations of controls, locking devices, and other accessories.
 - 6. Include diagrams for power, signal, and control wiring.

- D. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats.
 - 2. Bottom bar with sensor edge.
 - 3. Guides.
 - 4. Brackets.
 - 5. Hood.
 - 6. Locking device(s).
 - 7. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Certificates: Letter from manufacturer that doors provided comply with performance requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two (2) hours' normal travel time from Installer's place of business to Project site.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: Uniform pressure (velocity pressure) of 22 lbf/sq. ft. (1053 Pa) acting inward and 24 lbf/sq. ft. (1149 Pa) acting outward.
 - 2. Testing: According to ASTM E 330/E 330M.
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

2.3 DOOR ASSEMBLY (CD-1)

- A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide McKeon Rolling Steel Door Company, Inc.; ClimateGuard IS3020-M-PC or a comparable product by one of the following:
 - a. Clopay Building Products.
 - b. Cookson Company.
 - c. Cornell Iron Works, Inc.
 - d. Lawrence Roll-Up Doors, Inc.
 - e. Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. (5.1 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283.
- D. Assembly U-Factor: 0.31 maximum.
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) to 3-1/4-inch (83-mm) center-to-center height.
 - 1. Insulated-Slat Interior Facing: Metal.
 - 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

- G. Bottom Bar: Two angles, each not less than 2 by 2 by 1/8 inch (51 by 51 by 3 mm) thick; fabricated from hot-dip galvanized steel and finished to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- I. Hood: Match curtain material and finish.
 - 1. Shape: Square.
 - 2. Mounting: Face of wall.
- J. Electric Door Operator:
 - 1. Usage Classification: Light duty, up to 10 cycles per hour.
 - 2. Operator Location: Top of hood.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.44 m) or lower.
 - 4. Motor Exposure: Exterior, wet, and humid.
 - 5. Motor Electrical Characteristics:
 - a. Horsepower: 1/2 hp. minimum, as recommended in writing by manufacturer door size.
 - b. Voltage: 115-V ac, single phase, 60 Hz.
 - 6. Emergency Manual Operation: Crank type.
 - 7. Obstruction-Detection Device: Automatic photoelectric sensor.
 - 8. Control Station(s): Where indicated on Drawings.
- K. Curtain Accessories: Equip door with smoke seals.
- L. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from full range of RAL colors.
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm).
 - a. Provide 18- or 16-gage material if required by delegated design.

2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm).
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized-steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
- B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
1. Lock Cylinders: As specified in Section 08 71 00 "Door Hardware" and keyed to building keying system.
- B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.

2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. 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.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's high-performance baked-on finish consisting of prime coat and thermosetting topcoat design for improved friction resistance and rust-inhibiting performance. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

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

3.4 ADJUSTING

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

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 24 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

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

END OF SECTION 08 33 23

SECTION 08 34 53
SECURITY DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Security doors and frames.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware."
 - 2. Section 08 88 56 "Ballistics-Resistant Glazing" for glazing installed in security doors and frames.
 - 3. Section 28 10 00 "Access and Intrusion Systems" for access controls for security doors wired through security frames.

1.3 COORDINATION

- A. Coordinate installation of anchorages for security doors and frames. 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 adjacent construction. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.
- B. Shop Drawings: For security doors and frames.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
 - 3. Glazing details.

- C. Samples for Initial Selection:
 - 1. For frame members with factory-applied color finishes.
 - 2. For continuous geared hinges.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Framing: 12-inch- (305-mm-) long sections of frame members.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each type of security window and accessory indicated as ballistics resistant, for tests performed by a qualified testing agency.
- C. Examination reports documenting inspections of substrates, areas, and conditions.
- D. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- E. Field quality-control reports documenting inspections of installed products.
 - 1. Field quality-control certification signed by Contractor.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Pack security doors and frames in wood crates for shipment. Crate glazing separate from frames unless factory glazed.
- B. Label security window packaging with drawing designation.
- C. Store crated security doors and frames on raised blocks to prevent moisture damage.

1.9 FIELD CONDITIONS

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

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace security doors and frames that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including deflections exceeding 1/4 inch (6 mm).
 - b. Failure of welds.
 - c. Excessive air leakage.
 - d. Faulty operation of sliding window hardware.
 - e. Faulty operation of transom drawers.
 - f. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Attack Resistance: Provide units identical to those tested for compliance with requirements indicated, and as follows:
 - 1. Ballistics Resistance: Level 4 when tested according to UL 752.
- B. Structural Loads: Security doors and frames shall withstand the effects of wind loads, with no permanent deformation or breakage of components within window assembly when tested according to ASTM E330/E330M.

2.2 SECURITY DOORS AND FRAMES (SF-B#)

- A. Provide ballistics-resistant aluminum security doors and frames with framing on four sides and no operable sash or ventilator.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armortex; TH600 and HP500 or a comparable product by one of the following:
 - a. Total Security Solutions.
- B. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:
 - 1. Profile: Manufacturer's standard, with minimum face dimension indicated.
 - a. Minimum Face Dimension: 2-1/2 inches (64 mm).
 - 2. Depth: 6 inches (152 mm).
- C. Doors: Fabricate framing, glazing stops, and other components from aluminum.
 - 1. Configuration: Fully-glazed, as indicated on Drawings.

- D. Door Hardware:
 - 1. Factory prepare security doors and frames for hardware specified in Section 08 71 00 "Door Hardware," including reinforcement and stiffeners.
 - 2. Provide security door and frame manufacturer's standard heavy-duty continuous geared hinge, in finish selected by Architect.
- E. Glazing and Glazing Materials: Comply with requirements in Section 08 88 56 "Ballistics-Resistant Glazing."
- F. Materials:
 - 1. Aluminum Extrusions: ASTM B221 (ASTM B221M). Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength.
 - 2. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M).
 - 3. Bullet-Resistant Composite: Manufacturer's standard UL-listed composite for level of protection.

2.3 FABRICATION

- A. General: Fabricate security doors and frames to provide a complete system for assembly of components and anchorage of window units.
 - 1. Provide units that are re-glazable from the secure side without dismantling the attack side of framing.
- B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.
 - 1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security doors and frames to comply with ballistics-resistance performance indicated.
- C. Glazing Stops: Finish glazing stops to match security window framing.
 - 1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
 - 2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.
- D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- F. Weather Stripping: Factory applied.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 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.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Fasteners: Stainless steel, type 304.
- C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- D. Glazing Strips and Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Molded EPDM or neoprene gaskets complying with ASTM D2000, Designations 2BC415 to 3BC620; molded PVC gaskets complying with ASTM D2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric backing.
- E. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.
 - 1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
 - 2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
 - 3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Sealants: For sealants required within fabricated security doors and frames, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, non-shrinking, and nonmigrating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security doors and frames.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security doors and frames.
- D. Inspect built-in and cast-in anchor installations, before installing security doors and frames, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- E. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security doors and frames to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
 - 1. Install an attached or integral flange to secure side of security doors and frames extending over rough-in opening gap so that gap has same ballistics-resistance performance as security window.
- B. Glazed Framing: Provide sealant or gasket-glazed framing. Comply with installation requirements in Section 088853 "Security Glazing."
- C. Removable Glazing Stops and Trim: Fasten components with security fasteners.

- D. Fasteners: Install security doors and frames using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials.
- E. Sealants: Comply with requirements in Section 07 92 00 "Joint Sealants" for installing sealants, fillers, and gaskets.
 - 1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated.
 - 2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.
- F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.5 ADJUSTING

- A. Adjust security doors and frames to provide a tight fit at contact points and weather stripping for smooth operation and secure enclosure.
- B. Remove and replace defective work, including security doors and frames that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of security doors and frames. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
 - 1. Lubricate security door hardware.
- B. Provide temporary protection to ensure that security doors and frames are without damage at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain operable security doors and frames.

END OF SECTION 08 34 53

SECTION 08 34 73.13
METAL SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes metal sound control door assemblies.
- B. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames."
 - 2. Section 08 71 00 "Door Hardware."

1.3 COORDINATION

- A. Coordinate installation of anchorages for sound control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages. Deliver sleeves, inserts, anchor bolts, and items with integral anchors to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review procedures for coordinating frame and anchor installation with wall construction.
 - 2. Review required field quality-control procedures.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include sound ratings, construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. Shop Drawings: For sound control door assemblies.
 - 1. Include elevations of each door design.
 - 2. Include details of sound control seals, door bottoms, and thresholds.
 - 3. Include details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 4. Include frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Include locations of reinforcements and preparations for hardware.
 - 6. Include details of each different wall opening condition.
 - 7. Include details of anchorages, joints, field splices, and connections.

8. Include details of accessories.
9. Include details of moldings, removable stops, and glazing.
10. Include details of conduits and preparations for power, signal, and control systems.

- C. Schedule: Provide a schedule of sound control door assemblies prepared using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of sound control door assembly.
- C. Product Test Reports: For each sound control door assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sound control door assemblies to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Avoid the use of non-vented plastic.
 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two (2) removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Failure to meet sound rating requirements.
 - b. Faulty operation of sound seals.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.
2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sound Rating: Provide sound control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:
 1. STC Rating: 50 minimum, as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.
- B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Smoke- and Draft Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.2 STEEL SOUND CONTROL DOORS ("AHM")

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Allegion.
 2. Ambico Limited.
 3. Ceco Door; ASSA ABLOY.
 4. Curries Company; ASSA ABLOY.
 5. IAC Acoustics.
 6. Krieger Specialty Products Company.
 7. Noise Barriers, LLC.
 8. Wenger Corporation.
- B. Source Limitations: Obtain steel sound control door assemblies, including doors, frames, sound control seals, hinges, thresholds, and other items essential for sound control, from single source from single manufacturer.
- C. Doors: Flush-design sound control doors, thickness as required to provide STC rating, of seamless construction; with manufacturer's standard sound-retardant core as required to provide STC and fire rating indicated. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Fabricate according to NAAMM-HMMA 865.

1. Interior Doors: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.048-inch (1.21-mm) nominal thickness or thicker as required to achieve STC rating indicated.
2. Core: Manufacturer's standard sound control core.
3. Loose Stops for Glazed Lites in Doors: Same material as face sheets.
4. Top and Bottom Channels: Closed with continuous channels of same material as face sheets, spot welded to face sheets not more than 6 inches (152 mm) o.c.
5. Hardware Reinforcement: Same material as face sheets.

D. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 (Z180) zinc (galvanized) or A40 (ZF120) zinc-iron-alloy (galvannealed) coating designation.
4. Glazing: As required by sound control door assembly manufacturer to comply with sound control and fire-rated-door labeling requirements.

E. Finishes:

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.3 SOUND CONTROL FRAMES ("AHM")

A. Frames: Fabricate sound control door frames with corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate according to NAAMM-HMMA 865.

1. Weld frames according to NAAMM-HMMA 820.
2. Exterior Frames: Fabricate from metallic-coated steel sheet 0.079-inch (2.01-mm) nominal thickness or thicker as required to provide STC rating indicated.
3. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, 0.075-inch (1.90-mm) nominal thickness or thicker as required to provide STC rating indicated.
4. Hardware Reinforcement: Fabricate according to NAAMM-HMMA 865 of same material as face sheets.
5. Jamb Anchors:
 - a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064-inch (1.63-mm) nominal-thickness metallic-coated steel with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.156 inch (3.9 mm) thick.
 - b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048-inch (1.21-mm) nominal-thickness uncoated steel unless otherwise indicated.
6. Floor Anchors: Not less than 0.079-inch (2.01-mm) nominal-thickness metallic-coated steel, and as follows:

- a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

B. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B, with G60 (Z180) zinc (galvanized) or A40 (ZF120) zinc-iron-alloy (galvannealed) coating designation.
4. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153/A153M, Class B.
5. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A153/A153M or ASTM F2329.
6. Powder-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 sound control door frames of type indicated.
7. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

C. Finishes:

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.4 HARDWARE

- A. Sound Control Door Hardware: Manufacturer's standard sound control system, including head and jamb seals, door bottoms, cam-lift hinges, and thresholds, as required by testing to achieve STC and fire rating indicated.

1. Head and Jamb Seals:
 - a. Fire-Rated Openings:
 - 1) Silicone Compression Seals: One-piece units consisting of silicone compression bulb and stabilizer flange with intumescent material; attached to door frame adhesively.
 - b. Non-Fire-Rated Openings:
 - 1) Magnetic Seals: One-piece units consisting of closed-cell sponge neoprene seal and resiliently mounted magnet held in place by metal retainer, with retainer cover of same material as door frame; attached to door frame with concealed screws.
2. Door Bottoms: Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.

3. Cam-Lift Hinges: Full-mortise template type that raises door 1/2 inch (13 mm) when door is fully open; with hardened pin; fabricated from stainless steel.
4. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum or stainless steel.

B. Other Hardware: Comply with requirements in Section 087100 "Door Hardware."

2.5 SOUND CONTROL ACCESSORIES

- A. Glazing: Manufacturers' standard factory-installed glazing as required by testing to achieve STC and fire rating indicated.

2.6 FABRICATION

- A. Steel Sound Control Door Fabrication: Sound control doors 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.

1. Comply with requirements in NFPA 80 for fire-rated and smoke control doors.
2. Seamless Edge Construction: Fabricate doors with faces joined at vertical edges by welding; welds shall be ground, filled, and dressed to make them invisible and to provide a smooth, flush surface.
3. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated. Provide fixed stops and moldings welded on secure side of door.
4. Hardware Preparation: Factory prepare sound control doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
 - a. Reinforce doors to receive non-templated mortised and surface-mounted door hardware.
 - b. Locate door hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

5. Tolerances: Fabricate doors to tolerances indicated in NAAMM-HMMA 865.

- B. Sound Control Frame Fabrication: Fabricate sound control frames 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. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four (4) spot welds per anchor.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three (3) anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Four (4) anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
 - 2) Two (2) anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
5. Hardware Preparation: Factory prepare sound control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
- a. Reinforce frames to receive non-templated mortised and surface-mounted door hardware.
 - b. Locate hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
6. Tolerances: Fabricate frames to tolerances indicated in NAAMM-HMMA 865.

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.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound control door frame connections before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace sound control door frames to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install sound control door assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.
- B. Frames: Install sound control door frames in sizes and profiles indicated.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. At openings requiring smoke and draft control, install frames according to NFPA 105.
 - c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
 - d. Install sound control frames with removable glazing stops located on secure side of opening.
 - e. Remove temporary braces only after frames or bucks have been properly set and secured.
 - f. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Apply corrosion-resistant coating to backs of frames to be filled with mortar, grout, and plaster containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Fully fill frames with mineral-fiber insulation.
 4. Installation Tolerances: Adjust sound control door frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

- d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Doors: Fit sound control doors accurately in frames, within clearances indicated below. Shim as necessary.
 - 1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
 - a. Jambs: 1/8 inch (3 mm).
 - b. Head with Butt Hinges: 1/8 inch (3 mm).
 - c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch (9.5 mm).
 - d. Sill: Manufacturer's standard.
 - e. Between Edges of Pairs of Doors: 1/8 inch (3 mm).
 - 2. Fire-Rated Doors: Install fire-rated doors with clearances according to NFPA 80.
- D. Sound Control Seals: Where seals have been factory prefitted and preinstalled and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.
- E. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.
- F. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 07 92 00 "Joint Sealants."
- G. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with sound control door assembly manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Perform testing for verification that assembly complies with STC rating requirements.
 - 1. Acoustical testing and inspecting agency shall select one (1) sound control door(s) at random from sound control door assemblies that are completely installed for testing.
 - 2. Field tests shall be conducted according to ASTM E336, with results calculated according to ASTM E413. Acceptable field NIC values shall be within 5 dB of laboratory STC values.
 - 3. Inspection Report: Acoustical testing agency shall submit report in writing to Architect and Contractor within twenty-four (24) hours after testing.
 - 4. If tested door fails, replace or rework all sound control door assemblies to bring them into compliance at Contractor's expense.
 - a. Additional testing and inspecting at Contractor's expense will be performed to determine if replaced or additional work complies with specified requirements.
- C. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and adjust seals, door bottoms, and other sound control hardware items right before final inspection. Leave work in complete and proper operating condition.
- B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
 - 1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible, rust-inhibitive, air-drying primer.
- D. Metallic-Coated Surfaces: Clean abraded areas of doors and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 34 73.13

**SECTION 08 35 13
FOLDING DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes folding doors for interior locations.
- B. Related Requirements:
 - 1. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units on the building exterior.
 - 2. Section 08 71 00 "Door Hardware" for hardware not specified in Section 08 32 13.
 - 3. Section 10 14 23 "Panel Signage" for die-cut vinyl film applied to glazing of folding doors.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
- B. Shop Drawings: For folding doors.
 - 1. Include plans, elevations, sections, and details.
 - 2. Detail attachments to other work, and between units, if any.
 - 3. Include hardware and required clearances.
- C. Samples for Initial Selection: For each type of folding door indicated.
 - 1. Include Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For folding doors and components required, prepared on Samples of size indicated below:
 - 1. Main Framing Member: 12-inch-long (300-mm-long) section with weather stripping, glazing bead, and factory-applied color finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating folding doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to folding door manufacturer for installation of units required for this Project.

1.8 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of folding doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection.
 - c. Excessive water leakage or air infiltration.
 - d. Faulty operation of movable panels and hardware.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - f. Failure of laminated glass.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Nana Wall Systems, Inc.; NanaWall SL45 or a comparable product by one of the following:
 - 1. Euro-Wall.
 - 2. Milgard Manufacturing, Inc.
 - 3. Panoramic Doors.
 - 4. Solar Innovations, Inc.
- B. Source Limitations: Obtain folding doors from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Product Certification: AAMA certified with label attached to each door.
- B. Sound Transmission Class (STC): Rated for not less than 32 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
- C. Swinging Panel Operation Cycles: Rated for not less than 500,000 cycles as determined by AAMA 920.

2.3 FOLDING DOORS

- A. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Panel Size and Configuration: As indicated on Drawings.
 - 2. Panel Type: Hinged.
 - 3. Unit Operation: Outswing type.
 - 4. Stack Storage Configuration: Fold flat against wall.
 - 5. Mounting: Top hung.
- B. Threshold and Sill Cap/Track: Provide extruded-aluminum threshold and track of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated; with manufacturer's standard finish.
 - 1. Flush Sill: ADA-ABA compliant.

2.4 GLAZING

- A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal.
 - 1. Glass: ASTM C1036, Type 1, q3, Category II safety glass complying with testing requirements in 16 CFR 1201.
 - a. Thickness: 1/4 inches, nominal.
 - b. Type, Clear, laminated.
 - 2. Safety Glazing Labeling: Permanently mark safety 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.

2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum complying with AAMA 907 and designed to smoothly operate, tightly close, and securely lock folding doors.

- B. Door Pulls: Provide manufacturer's standard pull.
 - 1. Color and Finish: Brushed satin stainless steel.
- C. Lock: Install manufacturer's keyed cylinder lock and locking device on each movable panel, lockable from the inside and outside. Adjust locking device to allow unobstructed movement of the panel across adjacent panel in the direction indicated.
 - 1. Keying System: Coordinate with building keying system.

2.6 ACCESSORIES

- A. Fasteners: Stainless steel, compatible with door members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.
- B. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for folding doors, complying with ASTM B456 or ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

2.7 FABRICATION

- A. Fabricate folding doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- B. Fabricate folding doors that are re-glazable without dismantling panel framing.
- C. Weather Stripping: Provide full-perimeter weather stripping for each door panel.
- D. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to out of door panels.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- F. Factory-Glazed Fabrication: Glaze folding doors in the factory where practical and possible for applications indicated. Comply with requirements in Section 08 80 00 "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.

2.8 GENERAL FINISH REQUIREMENTS

- 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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.
- C. Examine built-in components to ensure a coordinated, air-tight folding door installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.
- B. Install folding doors level, plumb, square, true to line, without distortion, without warp or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water / weather barriers, and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- D. Install folding doors and components to drain condensation, water penetrating joints, and moisture migrating within doors to the outside of door panels.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Lubricate hardware and moving parts.
- B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and a weathertight closure. Adjust hardware for proper

alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

- C. Clean exposed surfaces immediately after installing folding doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect folding door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact folding door surfaces, remove contaminants immediately according to manufacturer's written instructions.
- F. Refinish or replace folding doors with damaged finishes.
- G. Replace damaged components.

END OF SECTION 08 35 13

SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Storefront framing.
 - 2. Manual-swing entrance doors.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants."
 - 2. Section 08 14 16 "Flush Wood Doors" for wood doors installed in aluminum framing systems.
 - 3. Section 08 41 13.13 "Fire-Rated Aluminum-Framed Entrances and Storefronts" for rated storefronts and entrance systems.
 - 4. Section 08 71 00 "Door Hardware."
 - 5. Section 08 80 00 "Glazing."

1.3 PREINSTALLATION MEETINGS

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

1.4 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. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations.
 - a. For storefront / curtain wall, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials.

- a. For recycled content steel or aluminum in storefront / curtain wall: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- 3. MR Credit 4: BPDO – Material Ingredients
 - a. For storefront / curtain wall, if available: Material Ingredient Report.
- 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
- C. 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.
 - 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- G. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

- H. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and field testing agency.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Source quality-control reports.
- F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by the International Accreditation Service or the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Warranty: Manufacturer 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. Deterioration of metals and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Finish Warranty: 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 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Recycled content: Provide aluminum and steel components with recycled content.
 - 2. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- C. 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.
- D. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
- E. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
- F. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including 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 ten (10) seconds.
- G. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- H. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Glazing and framing areas shall have U-factor of not more than values below, as determined according to NFRC 100.
 - a. Fixed framing: 0.34 Btu/sq. ft. x h x deg F.
 - b. Entrance doors: 0.52 Btu/sq. ft. x h x deg F.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than values below as determined according to NFRC 200.
 - a. Fixed framing: 0.23 maximum.
 - b. Entrance doors: 0.14 maximum.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 65 as determined according to NFRC 500.
- J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
1. Outdoor-Indoor Transmission Class: Minimum 26.
- K. Sound Transmission Class (STC): Framing and glazing assembly rated for not less than 35 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
- L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 STOREFRONT SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide YKK AP America Inc.; YES 45 XT at exterior and YES 45 FS at interior or a comparable product by one of the following:
1. EFCO Corporation; Series 403X, Series 401(NT), D502, and D518.
 2. Kawneer North America; an Alcoa company; Trifab 451UT, VersaGlaze 450, AA425, and 500.
 3. Oldcastle Building Envelope; Series 3000 XT and FG-1000.
 4. Wausau, Inc.; Thermal=Block TU24000 and 4500.
- 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: Dual thermal barriers.
 2. Interior Vestibule Framing Construction: Nonthermal.
 3. Glazing System: Retained mechanically with gaskets on four (4) sides.

4. Glazing Plane: Center.
 5. Finish: High-performance organic finish.
 6. Fabrication Method: Field-fabricated stick system.
 7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 8. 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.

2.4 ENTRANCE DOOR SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide YKK AP America Inc.; MegaTherm 50XT at exterior and 50D at interior or a comparable product by one of the following:
1. EFCO Corporation; D502, and D518.
 2. Kawneer North America; an Alcoa company; 500T and 500.
 3. Oldcastle Building Envelope.
 4. Wausau, Inc.; Therml=Block and Standard Wide Stile.
- B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
1. Door Construction: 2- to 2-1/4-inch (50.8- to 57.2-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.
1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

3. Opening-Force Requirements:

- a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
- b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

2.6 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: Comply with Section 08 80 00 "Glazing."

2.7 MATERIALS

- A. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
 - 4. 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 according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.8 ACCESSORIES

- A. Automatic Door Operators: Section 08 71 00 "Door Hardware."
- B. 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.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) 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 A 123/A 123M or ASTM A 153/A 153M requirements.
- D. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 240/A 240M, of type recommended by manufacturer.
- E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.
- F. Rigid PVC Filler.

2.9 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.
 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. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. 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.
- C. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 08 80 00 "Glazing."

- G. Install weatherseal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant, as recommended by sealant manufacturer.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 - 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test 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 according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two (2) tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three (3) tests, prior to 10, 35, and 70 percent completion.
 - 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of two (2) tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three (3) tests, prior to 10, 35, and 70 percent completion.

3. Water Penetration: ASTM E 1105 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. (300 Pa), and shall not evidence water penetration.
 4. Repair installation areas damaged by testing.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
 - D. Prepare test and inspection reports.
- 3.6 MAINTENANCE SERVICE
- A. Entrance Door Hardware:
 1. 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 entrance door hardware.

END OF SECTION 08 41 13

SECTION 08 41 13.13
FIRE-RATED ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Fire-rated storefront framing.

- B. Related Requirements:

- 1. Section 08 16 13 "Fiberglass Doors" for fire-rated fiberglass doors installed in fire-rated aluminum framing systems, including field quality control requirements.
 - 2. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for non-fire-rated systems.
 - 3. Section 08 71 00 "Door Hardware."
 - 4. Section 08 88 13 "Fire-Resistant Glazing" for fire-protection- and fire-resistance-rated glazing installed in fire-rated aluminum framing systems.

1.3 PREINSTALLATION MEETINGS

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

1.4 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. LEED Submittals: Comply with Section 01 81 13.

- 1. MR Credit 2: BPDO – Environmental Product Declarations

- a. For storefront / curtain wall, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.

- 2. MR Credit 3: BPDO – Sourcing of Raw Materials

- a. For recycled content steel or aluminum in storefront / curtain wall: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

3. MR Credit 4: BPDO – Material Ingredients
 - a. For storefront / curtain wall, if available: Material Ingredient Report.
 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - C. Shop Drawings: For fire-rated 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.
 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
 - D. Samples for Initial Selection: For units with factory-applied color finishes.
 - E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
 - F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
 - B. Product Test Reports: For fire-rated aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.
 - C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-rated aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of fire-rated 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. Deterioration of metals, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Finish Warranty: 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 five (5) Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Recycled content: Provide aluminum and steel components with recycled content.
 - 2. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. General Performance: Comply with performance requirements specified, as determined by testing of fire-rated 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. Fire-rated 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.
- C. Fire-Rated 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 positive pressure according to NFPA 252 or UL 10C.
 - 1. Temperature-Rise Limit: Where indicated, 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.
- D. Fire Rated Frames: Frames complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire ratings indicated, based on testing according to ASTM E 119 or UL 263.
- E. Smoke and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
 - 1. Maximum air leakage of 3.0 cfm/sq. ft. (15 L/s per sq. m) at an air pressure differential of 0.10 inch WC (24.9 Pa).
- F. Fire Ratings: Provide fire-protective and fire-resistive rated door and frame assemblies to comply with the above requirements and the following ratings. Where sizes of glazing indicated on Drawings exceeds allowable or manufacturer's tested size of fire-protective rated assembly, provide fire-resistive rated assembly.

1. Doors:
 - a. Typical, unless otherwise noted: 45-minute.
 - b. Stairs: 60-minute, temperature rise.
 - c. Fire Wall and Classroom Separation: 90-minute, temperature rise.
2. Door Vision Panels:
 - a. Typical, unless otherwise noted: D-H-45.
 - b. Stairs: ≤100 square inches D-H-60 and >100 square inches D-H-T-W-60.
 - c. Fire Wall and Classroom Separation: ≤100 square inches D-H-90 and >100 square inches D-H-W-90.
3. Sidelight/Transom Panel:
 - a. Typical, unless otherwise noted: D-H-45.
 - b. Stairs: W-60.
 - c. Fire Wall and Classroom Separation: W-120.
4. Windows/Borrow Lites:
 - a. Typical, unless otherwise noted: W-60.
 - b. Fire Wall and Classroom Separation: W-120.

G. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans of less than 11 feet 8-1/4 inches (3.6 m).

H. Source Limitations: Provide products including framing, glazing, hardware, and accessories in accordance with tested system.

2.3 FIRE-RATED STOREFRONT SYSTEMS (AL-#, SF-#)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide SAFTI FIRST Fire Rated Glazing Solutions; GPX Architectural Series Framing, or a comparable product by one of the following:
1. ASSA ABLOY; frameworks.
 2. Aluflam North America.
 3. Technical Glass Products.

4. Vetrotech Saint Gobain International.
- B. Framing Members: Manufacturer's extruded or formed-aluminum or aluminum-clad-steel framing members of thickness required and reinforced as required to support imposed loads.
 1. Finish: Clear anodic finish.
 2. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 3. 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.

2.4 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.
 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- C. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000 molded neoprene or ASTM D 2287 molded PVC.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.5 GLAZING

- A. Glazing: Comply with Section 08 88 13 "Fire-Resistant Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.6 MATERIALS

- A. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
 - 4. 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 according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.7 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.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) 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 A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 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 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. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare surfaces that are in contact with sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. 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.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 08 80 00 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install fire-rated aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. 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 entrance door hardware.

END OF SECTION 08 41 13.13

SECTION 08 44 13
GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazed aluminum curtain walls and sun shading devices.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants."
 - 2. Section 08 41 13 "Aluminum Framed Entrances and Storefronts" for entrance systems included in curtain walls.
 - 3. Section 08 80 00 "Glazing" for glazing in curtain walls.

1.3 PREINSTALLATION MEETINGS

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

1.4 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. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For curtainwall, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 4: BPDO – Material Ingredients
 - a. For curtainwall, if available: Material Ingredient Report.
 - 3. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content aluminum: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 4. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
- C. Shop Drawings: For glazed aluminum curtain walls. 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 vertical-to-horizontal intersection of glazed aluminum curtain walls, 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.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- G. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and field testing agency.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall 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. Deterioration of metals and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Finish Warranty: 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 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. LEED Requirements:

1. Recycled Content of Aluminum and Steel: Provide minimum 25 percent post-consumer recycled content.
2. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazed aluminum curtain walls.

C. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, 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.

D. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch (6.35-mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).

F. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including 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.

G. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).

I. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.35 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 - a. Operable framing and entrance doors: As required in Section 08 41 13.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.23 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 75 as determined according to NFRC 500.

J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:

1. Outdoor-Indoor Transmission Class: Minimum 30.

K. Sound Transmission Class (STC): Framing and glazing assembly rated for not less than 35 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

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

1. EFCO Corporation; System 5500X.
2. Kawneer North America, an Arconic company; 1600UT System 1.
3. Oldcastle, Inc.

4. Wausau Window and Wall Systems; Apogee Wausau Group, Inc.
5. YKK AP America Inc; YCW 750 XT.

- B. Source Limitations: Obtain all components of curtain wall system, including framing, entrances and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced, as required to support imposed loads.

1. Construction: Dual thermal barrier.
2. Glazing System: Retained mechanically with gaskets on four (4) sides.
3. Glazing Plane: Front.
4. Finish: Clear anodic finish.
5. Fabrication Method: Either factory- or field-fabricated system.

- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

- D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: 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 according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCES

- A. Entrances: Comply with Section 08 41 13 "Aluminum-Framed Entrances and Storefronts."

2.5 SUN CONTROL

- A. Sunshades: Assemblies consisting of manufacturer's standard outrigger brackets, louvers, and fascia, designed for attachment to curtain wall with mechanical fasteners.

1. Basis-of-Design: Kawneer Versoleil SunsShade Outrigger System.
2. Orientation: Horizontal.
3. Projection from Wall: 30 inches (762 mm).
4. Outriggers: Straight with square edges.
5. Louvers:
 - a. Number: Four (4) louvers per unit.
 - b. Shape: Planar.
6. Fasciae: Rectangular.
7. Finish: Match adjacent glazed aluminum curtain wall.

2.6 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.7 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 (25.4 mm) 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 A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 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.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration as follows:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.

3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers, as recommended by manufacturer for this purpose.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.
- C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three (3) tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three (3) tests, prior to 10, 35, and 70 percent completion.
 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of three (3) tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three (3) tests, prior to 10, 35, and 70 percent completion.
 3. Water Penetration: ASTM E 1105 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. (300 Pa), and shall not evidence water penetration.
- D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 08 44 13

SECTION 08 45 23
FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes aluminum-framed assemblies incorporating fiberglass-sandwich panels as follows:
 - 1. Wall assemblies.
 - 2. Canopy assemblies.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.
- B. Shop Drawings: For panel assemblies.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.
- C. Samples: In manufacturer's standard size.
 - 1. For each type of fiberglass-sandwich panel.
 - 2. For each type of exposed finish for framing members.
- D. Fabrication Samples: Of each framing system intersection and adjacent panels, made from 12-inch (305-mm) lengths of full-size framing members and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Fiberglass-sandwich panels.
 - 5. Flashing and drainage.

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer, manufacturer, and testing agency.
- B. Product Test Reports: For each fiberglass-sandwich-panel assembly, for tests performed by a qualified testing agency.
 - 1. International Building Code Evaluation Report
 - 2. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
 - 3. Burn Extent (ASTM D 635)
 - 4. Color Difference (ASTM D 2244)
 - 5. Impact Strength (UL 972)
 - 6. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
 - 7. Bond Shear Strength (ASTM D 1002)
 - 8. Beam Bending Strength (ASTM E 72)
 - 9. Insulation U-Factor (NFRC 100)
 - 10. Visible Light transmission (NFRC 202)
 - 11. NFRC System U-Factor Certification (NFRC 700)
 - 12. Solar Heat Gain Coefficient (NFRC or Calculations)
 - 13. Air Leakage (ASTM E 283)
 - 14. Structural Performance (ASTM E 330)
 - 15. Water Penetration (ASTM E 331)
 - 16. 1200°F Fire Resistance (SWRI)
- C. Evaluation Reports: For fiberglass-sandwich-panel assemblies from ICC-ES.
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: For fiberglass-sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, accredited quality-control agency for compliance with applicable requirements in ICC-ES AC04 or ICC-ES AC177.
- B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies 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. Deterioration of metals and other materials beyond normal weathering.
 - c. Water leakage.
- 2. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace fiberglass-sandwich panels that exhibit defects in materials or workmanship within specified warranty period.
 - 1. Defects include, but are not limited to, the following:
 - a. Delamination of coating, if any, from exterior face sheet.
 - b. Color change exceeding requirements.
 - c. Delamination of panel face sheets from panel cores.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace fiberglass-sandwich panels that exhibit defects in materials or workmanship within specified warranty period.
 - 1. Defects include, but are not limited to, the following:
 - a. Fiberbloom.
 - 2. Warranty Period: Twenty (20) years from date of Substantial Completion.
- D. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design fiberglass-sandwich-panel assemblies.
- B. Structural Loads: As indicated on Drawings.
- C. Deflection Limits:
 - 1. Vertical Panel Assemblies: Limited to 1/120 of clear span for each assembly component.
- D. Structural-Test Performance: Provide panel assemblies tested according to ASTM E330, as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and 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 ten (10) seconds.
- E. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of twenty (20) percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).
- F. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- G. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:
1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.28 Btu/sq. ft. x h x deg F (1.82 W/sq. m x K) as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a SHGC of no greater than 0.27 as determined according to NFRC 200.
 3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. (0.05 L/s per sq. m) of fixed wall area as determined according to ASTM E283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 4. Visible Light Transmittance (VLT): Panels shall have VLT of not less than 0.20 as determined according to NFRC.
 5. Condensation Resistance Factor (CRF): Panels shall have CRF of no less than eighty (80) as determined according to AAMA 1503 measured on the bond line.

2.2 FIBERGLASS-SANDWICH-PANEL ASSEMBLIES ("FSPA")

- A. Fiberglass-Sandwich-Panel Assemblies: Translucent assemblies that are supported by aluminum framing and glazed with fiberglass-sandwich panels.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation; Thermally-Break System or a comparable product by one of the following:
 - a. Major Industries, Inc.

2.3 FIBERGLASS-SANDWICH PANELS

- A. Fiberglass-Sandwich Panels: Uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core.
1. Core Insulation: Manufacturer's standard, for specified performance requirements.
- B. Panel Thickness: 2-3/4 inches (70 mm).

- C. Grid Core: Mechanically interlocked, extruded-aluminum I-beams, with a minimum flange width of 7/16 inch (11.1 mm).
 - 1. Extruded Aluminum: ASTM B221 (ASTM B221M), in alloy and temper recommended in writing by manufacturer.
 - 2. I-Beam Construction: Thermally broken, extruded aluminum.
 - 3. Grid Pattern: Inline rectangle, nominal 12 by 24 inches (305 by 610 mm).
- D. Exterior Face Sheet:
 - 1. Thickness: 0.070 inch (1.78 mm).
 - 2. Color: Crystal.
 - 3. Protective Weathering Surface: Manufacturer's standard.
- E. Interior Face Sheet:
 - 1. Thickness: 0.045 inch (1.14 mm).
 - 2. Color: White.
- F. Fiberglass-Sandwich-Panel Adhesive: Manufacturer's standard for permanent adhesion of facings to cores.
- G. Panel Strength:
 - 1. Maximum Panel Deflection: 3-1/2 inches (89 mm) when a 4-by-12-foot (1.2-by-3.6-m) panel is tested according to ASTM E72 at 34 lbf/sq. ft. (1.6 kPa), with a maximum 0.090-inch (2.3-mm) set deflection after five (5) minutes.
 - 2. Panel Support Strength: Capable of supporting, without failure, a 300-lbf (1334-N) concentrated load when applied to a 3-inch- (76-mm-) diameter disk according to ASTM E661.
- H. Panel Performance:
 - 1. Self-Ignition Temperature: 650 deg F (343 deg C) or more according to ASTM D1929.
 - 2. Smoke-Developed Index: 450 or less according to ASTM E84, or 75 or less according to ASTM D2843.
 - 3. Combustibility Classification: Class CC1 based on testing according to ASTM D635.
 - 4. Interior Finish Classification: Class B based on testing according to ASTM E84.
 - 5. Color Change: Not more than 3.0 units Delta E, when measured according to ASTM D2244, after outdoor weathering compliant with procedures in ASTM D1435.
 - a. Outdoor Weathering Conditions: Sixty (60) months in southern Florida.
 - 6. Impact Resistance: No fracture or tear at impact of 70 ft. x lbf (95 J) by a 3-1/4-inch- (83-mm-) diameter, 5-lb (2.3-kg) freefalling ball according to UL 972 test procedure.
 - 7. Haze Factor: Greater than 90 percent when tested according to ASTM D1003.

2.4 ALUMINUM FRAMING SYSTEMS

- A. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken, extruded aluminum.

- B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B209 (ASTM B209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B429 (/B 429M).
 - 4. Structural Profiles: ASTM B308 (/B 308M).
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning skylight components.
- D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, non-staining, and nonbleeding fasteners and accessories; compatible with adjacent materials.
 - 1. At closures, retaining caps, or battens, use ASTM A193 (/A 193M), 300 series stainless-steel screws.
 - 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 (/A 123M) or ASTM A153 (/A 153M) requirements.
- F. Anchor Bolts: ASTM A307, Grade A, galvanized steel.
- G. Concealed Flashing: Corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials.
- H. Exposed Flashing and Closures: Aluminum sheet not less than 0.040 inch (1.02 mm) thick, finished to match framing.
- I. Framing Gaskets: Manufacturer's standard.
- J. Frame-System Sealants: As recommended in writing by manufacturer.
- K. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

- A. Frame System Fabrication:
 - 1. Fabricate components that, when assembled, have the following characteristics:
 - a. Profiles that are sharp, straight, and free of defects or deformations.
 - b. Accurately fitted joints with ends coped or mitered.
 - c. Internal guttering systems or other means to drain water passing through joints, and moisture migrating within assembly to exterior.
 - 2. Fabricate sill closures with weep holes and for installation as continuous component.
 - 3. Reinforce components as required to receive fastener threads.

B. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
 - a. White spots indicating lack of bond at intersections of grid-core members are limited in number to four for every 40 sq. ft. (3.7 sq. m) of panel and limited in diameter to 3/64 inch (1.2 mm).
2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, 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.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions.
1. Do not install damaged components.
 2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 3. Rigidly secure nonmovement joints.
 4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
 5. Seal joints watertight unless otherwise indicated.
- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install components plumb and true in alignment with established lines and elevations.
- D. Skylight Assemblies: Install continuous aluminum sill closures with weatherproof expansion joints and locked and sealed corners. Locate weep holes at rafters. Install components to drain water passing through joints and moisture migrating within assembly to exterior.
- E. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:

1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m), but no greater than 1/2 inch (13 mm) over total length.

END OF SECTION 08 45 23

SECTION 08 71 00

DOOR HARDWARE

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. Mechanical and electrified door hardware for:
 - a. Swinging doors.
2. Electronic access control system components, including:
 - a. Electronic access control devices.
3. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
3. Division 26 sections for connections to electrical power system and for low-voltage wiring.
4. Division 28 sections for coordination with other components of electronic access control system.

1.03 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.

B. Action Submittals:

1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
 - a. Door Index; include door number, heading number, and Architects hardware set number.
 - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 - c. Quantity, type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for local manufacturer's representative for each product.
 - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
 - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
5. Key Schedule:
 - a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product data for electrified door hardware:

- a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - 3. Certificates of Compliance:
 - a. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
 - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
 - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
 - 4. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
- 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Factory order acknowledgement numbers (for warranty and service)
 - d. Name, address, and phone number of local representative for each manufacturer.
 - e. Parts list for each product.
 - f. Final approved hardware schedule, edited to reflect conditions as-installed.
 - g. Final keying schedule
 - h. Copies of floor plans with keying nomenclature
 - i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.05 QUALITY ASSURANCE

- A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 - 4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

- B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
 2. Can provide installation and technical data to Architect and other related subcontractors.
 3. Can inspect and verify components are in working order upon completion of installation.
 4. Capable of producing wiring diagrams.
 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
- G. Keying Conference
1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- H. Pre-installation Conference
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.
- I. Coordination Conferences:
1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
 - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 - 2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 - 1. Promptly replace products damaged during shipping.
 - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
 - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.07 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.08 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.

- a. Closers:
 - 1) Mechanical: 30 years.
 - 2) Electrified: 2 years.
 - b. Automatic Operators: 2 years.
 - c. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - d. Locksets:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - e. Continuous Hinges: Lifetime warranty.
 - f. Key Blanks: Lifetime
2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.09 MAINTENANCE

- A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
- 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

- A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Ives 5BB series.
2. Acceptable Manufacturers and Products: Hager BB series, Bommer BB5000 series.

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

2.04 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:

- a. Scheduled Manufacturer: Ives.
- b. Acceptable Manufacturers: Hager.

2. Requirements:

- a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
- b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
- c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
- d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
- e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
- f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
- g. Install hinges with fasteners supplied by manufacturer.
- h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

- a. Scheduled Manufacturer: Von Duprin EPT-10.
- b. Acceptable Manufacturers: ABH PT1000, Securitron CEPT-10.

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

- 1. Scheduled Manufacturer: Ives.
- 2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

- 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and

strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.08 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

- a. Lever Design: Schlage 06A.

2.09 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Best 9K series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

- a. Lever Design: Best 15 lever.

2.10 AUXILIARY LOCKS

A. Deadlocks:

1. Manufacturers and Products:
 - a. Scheduled Manufacturer and Product: Schlage L400 series.
 - b. Acceptable Manufacturers and Products: No substitution.
2. Requirements:
 - a. Provide mortise deadlock series conforming to ANSI/BHMA A156 and function as specified.
 - b. Cylinders: Refer to "KEYING" article, herein.
 - c. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
 - d. Provide manufacturer's standard strike.

2.11 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 99/33A series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.

8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylindrical or hex-key dogging as specified at non fire-rated openings.
11. Provide dogging indicators (CDSI) for visible indication of dogging status.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.12 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Best.

B. Requirements:

1. Provide interchangeable cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

C. Construction Keying:

1. Replaceable Construction Cores.
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.13 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Provide cylinders/cores keyed into Owner's existing factory registered keying system.
- C. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- D. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - a. Master Keying system as directed by the Owner.
2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features:
 - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - b. Patent Protection: Keys and blanks protected by one or more utility patent(s).
4. Identification:
 - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.
 - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
5. Quantity: Furnish in the following quantities.
 - a. Change (Day) Keys: 3 per cylinder/core.
 - b. Permanent Control Keys: 3.
 - c. Master Keys: 6.

2.14 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer: Telkee.
2. Acceptable Manufacturers: No substitution.

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.15 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.16 ELECTRO-MECHANICAL CLOSER/HOLDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040SE/4310ME/4410ME series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide single-point or multi-point hold-open electro-mechanical closer/holders as specified. Coordinate voltage requirements and provide transformer if necessary.
2. Provide multi-point electro-mechanical closer/holders with swing free arms.
3. Provide closer/holders that function as full rack and pinion door closer when current is interrupted or continuous hold-open is not engaged.
4. Provide door closers with fully hydraulic, full rack and pinion action with high strength cylinder and full complement bearings at shaft.
5. Cylinder Body: 1-1/2 inch (38 mm) diameter with 5/8 inch (16 mm) diameter double heat-treated pinion journal.
6. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
7. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
8. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
9. Pressure Relief Valve (PRV) Technology: Not permitted.

10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.17 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.18 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
 - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson.
2. Acceptable Manufacturers: ABH.

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.20 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.21 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero International.
2. Acceptable Manufacturers: National Guard, Reese.

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Size of thresholds:

- a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
 - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.22 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Hager, Rockwood.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.23 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN.
2. Acceptable Manufacturers: Rixson.

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.24 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Schlage.
2. Acceptable Manufacturers: Interlogix, SDC.

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.25 FINISHES

- A. Finish: BHMA 626/652 (US26D); except:
1. Hinges at Exterior Doors: BHMA 630 (US32D)
 2. Continuous Hinges: BHMA 628 (US28)
 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
 4. Protection Plates: BHMA 630 (US32D)
 5. Overhead Stops and Holders: BHMA 630 (US32D)
 6. Door Closers: Powder Coat to Match
 7. Wall Stops: BHMA 630 (US32D)
 8. Gasketing: Clear Anodized Aluminum
 9. Thresholds: Mill Finish Aluminum

2.26 ELECTRONIC ACCESS CONTROL SYSTEM REQUIREMENTS

- A. Summary of Work: The hardware supplier shall obtain the services of a Lenel integrator to furnish and install the hardwire Electronic Access Control System (EAC) under this Section. The EAC system shall be tied into Frederick County Public Schools (FCPS) existing Lenel Access Control Software System. Through the hardware supplier, electrical contractor shall furnish all labor, material and services necessary to install a complete EAC system. Note, regardless of door and frame material, the EAC system shall be included in the hardware supplier scope of work. No deviations will be allowed. Card Readers shall be provided at the following doors...

001/2	019/1	307/1	503/1	720/2
001/4	019/2	311/1	608/1	906/2
003/1	019/4	315/2	608/2	913A/1
010/1	021/1	400/1	609/2	B101/2
011/1	021/2	401/1	700/1	C105/1
011/2	025/1	402/2	712/1	D104/1
013/1	100/1	403/2	714A/1	
014/2	200/1	500/3	718/2	
017A/1	304/1	500/4	719/1	

- B. Access Control System Equipment Requirements: Furnish the following equipment:
1. One (1) Intelligent System Controller / Network Device / Communication Cable & Enclosure # BAS-2220 x LS-MSS100-1 x HOC-ETHLAN.
 2. HID Proximity Card Reader #910NNNNEK2037P (Black) as shown on security plans.
 3. Dual Reader Interface Module BAS-1320 as required.
 4. Minimum of one (1) "UL" listed Power Supplies & Enclosure BAS-AL600ULM x ABT-12 per School.
 5. Wiring requirements are 18 gauge, 4 paired, (8 wire) twisted, shield, plenum rated "UL" listed. Note: Wire shall be provided and installed by electrical contractor. The Electrical Contractor shall provide conduit as required, under Division 16.

Note: Equipment shall be configured and engineered to suit overall system requirements. Above quantities may vary.

- C. Hardware Requirements and Door Application:

1. Furnish hardware as specified in HW schedule. All electrified hardware shall be interfaced with the EAC system, and be connected to the emergency generator. Regardless of door and frame material, electrified hardware shall be included in the hardware supplier scope of work.

D. Power and Network Requirements:

1. As necessary, the Electrical Contractor responsible for Division 16 shall provide switched 120V power, conduit and junction boxes at each card reader location and in the Server/Telecom room for EAC equipment. General Contractor shall be responsible for providing a network drop at the Server/Telecom room. FCPS shall provide a dedicated IP address to integrator before EAC system start up. EAC system consisting of card reader system and electrified hardware controlled by card access shall be tied into the emergency generator back up system. In addition, provide battery back up at Main Entrance door. Prior to installation, coordinate final location of card readers and access control equipment with FCPS.

E. Owner Provided:

1. Proximity credentials shall be furnished and programmed by FCPS.

F. Submittals:

1. In accordance with Division 1, submit shop drawings and catalog cuts for approval.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
- I. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- K. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 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.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

- A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
- B. Hardware Sets:

HARDWARE GROUP NO. 01

FOR USE ON MARK #(S):

001/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY-EPT	628	IVE
2	EA	POWER TRANSFER	EPT-10	628	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	AUTO OPERATOR	9542 HL/B MS	ANCLR	LCN
1	EA	SURFACE CLOSER	4040XP SCUSH ST-2776	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN

1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	ACTUATOR	8310-813	BLK	LCN
2	EA	MOUNTING BOX	8310-867F/S	BLK	LCN
1	EA	ROCKER SWITCH	8310-806R	BLK	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	THRESHOLD	545A	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	POWER SUPPLY	PS904-BBK-4R-KL		VON
2	EA	DOOR CONTACT	679-05	GRY	SCE
1	EA	REMOTE	BY DIVISION 28		AIP
		RELEASE/INTERCOM			

DOOR NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR REMOTE RELEASE OR KEY OVERRIDE

UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOORS REMAIN LOCKED

DOORS MONITORED

OUTSIDE ACTUATOR INACTIVE WITHOUT VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR REMOTE RELEASE

INSIDE ACTUATOR ALWAYS ACTIVE

HARDWARE GROUP NO. 01A

FOR USE ON MARK #(S):

001/4

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	CONT. HINGE	112XY-EPT	628	IVE
1	EA	POWER TRANSFER	EPT-10	628	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	ELEC PANIC	QEL-XP99-EO	626	VON
		HARDWARE			
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	AUTO OPERATOR	9542 HL/B MS	ANCLR	LCN
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	ACTUATOR	8310-813	BLK	LCN
2	EA	MOUNTING BOX	8310-867F/S	BLK	LCN
1	EA	ROCKER SWITCH	8310-806R	BLK	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8192AA	AA	ZER

1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05	GRY	SCE
1	EA	POWER SUPPLY	PS904-4R-KL		VON

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
DOOR MONITORED
OUTSIDE ACTUATOR INACTIVE WITHOUT VALID CREDENTIAL OR ACCESS CONTROL TIME
ZONE OR REMOTE RELEASE
INSIDE ACTUATOR ALWAYS ACTIVE

HARDWARE GROUP NO. 01B

FOR USE ON MARK #(S):

401/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	CONT. HINGE	112XY-EPT	628	IVE
1	EA	POWER TRANSFER	EPT-10	628	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	188S	BK	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	POWER SUPPLY	PS904-4R-KL		VON
2	EA	DOOR CONTACT	679-05	GRY	SCE

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
DOOR MONITORED

HARDWARE GROUP NO. 02

FOR USE ON MARK #(S):

001/3

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8192AA	AA	ZER

HARDWARE GROUP NO. 03

FOR USE ON MARK #(S):

401/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
2	EA	DUMMY PUSH PAD	330	626	VON
2	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER

HARDWARE GROUP NO. 03A

FOR USE ON MARK #(S):

017A/2

025/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
2	EA	DUMMY PUSH PAD	330	626	VON
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN

2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER

HARDWARE GROUP NO. 03B

FOR USE ON MARK #(S):

001/1 914/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

DOOR MONITORED

HARDWARE GROUP NO. 04

FOR USE ON MARK #(S):

500/3

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE

2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS-KL		VON

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
DOOR MONITORED

HARDWARE GROUP NO. 04A

FOR USE ON MARK #(S):

003/1	010/1	011/2	013/1	017A/1	019/2
C105A/1	019/4	021/2	025/1	500/4	D104/1
913A/1					

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
1	EA	RAIN DRIP	142AA	Aa	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904-BBK 900-2RS-KL		VON

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED DOOR
MONITORED

HARDWARE GROUP NO. 04B

FOR USE ON MARK #(S):

400/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	5654-XP-STAB	628	VON
1	EA	PANIC HARDWARE	LD-XP99-EO	626AM	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626AM	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH SRI	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
1	EA	RAIN DRIP	142AA	Aa	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904-BBK 900-2RS-KL		VON

DOOR NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED DOOR
MONITORED

HARDWARE GROUP NO. 04C

FOR USE ON MARK #(S):

609/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	CONT. HINGE	112HD	628	IVE

1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	GASKETING	188S	BK	ZER
1	EA	RAIN DRIP	142AA	Aa	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904-BBK 900-2RS-KL		VON

DOOR NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE

UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED DOOR
MONITORED

HARDWARE GROUP NO. 07

FOR USE ON MARK #(S):

012/1 020/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224HD	628	IVE
2	EA	FIRE EXIT HARDWARE	9949-EO-F-LBL	626	VON
2	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
2	EA	MEETING STILE	8194AA 84" (2134MM)	AA	ZER

MAGNETIC HOLD OPENS TO BE TIED TO FIRE ALARM SYSTEM AND RELEASE UPON
ACTIVATION OF FIRE ALARM.

HARDWARE GROUP NO. 08

FOR USE ON MARK #(S):

303/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 08A

FOR USE ON MARK #(S):

100/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	SURFACE CLOSER	4040XP EDA X ST-2776	689	LCN
1	EA	OVERHEAD STOP	100S-ADJ	630	GJ
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	DESK PUSH BUTTON	660-T4	628	SCE
1	EA	POWER SUPPLY	PS902-4R-FA-KL (SHARE WITH A101C)		VON

DURING OCCUPIED HOURS, DOORS (100/2 & 109/1) NORMALLY UNLOCKED BY ACCESS CONTROL TIME ZONE OR PUSH BUTTON
DOORS LOCK WITH ACCESS CONTROL TIME ZONE OR DESK MOUNTED PUSH BUTTON OR DURESS BUTTON
AFTER HOURS, DOORS NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH KEY OVERRIDE OR WHEN UNLOCKED WITH PUSH BUTTON OR ACCESS CONTROL TIME ZONE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED

HARDWARE GROUP NO. 08B

FOR USE ON MARK #(S):

200/1 304/1 311/1 700/1 714A/1 719/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE

3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR CONTACT	679-05	BLK	SCE
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	POWER SUPPLY	PS902-4R-FA-KL		VON

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
DOOR MONITORED

HARDWARE GROUP NO. 08C

FOR USE ON MARK #(S):

402/2 403/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	SURFACE CLOSER	4040XPSRI	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR CONTACT	679-05	BLK	SCE
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	POWER SUPPLY	PS902-4R-FA-KL		VON

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
DOOR MONITORED

HARDWARE GROUP NO. 08D

FOR USE ON MARK #(S):

307/1 608/1 712/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	SURFACE CLOSER	4040XPRW/PA	689	LCN
1	EA	OVERHEADSTOP	100S-ADJ	630	GJ
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	188S	BK	ZER

1	EA	DOOR CONTACT	679-05	BLK	SCE
1	EA	CREDENTIAL READER	#910NNNEK2037P	BLK	HID
1	EA	POWER SUPPLY	PS902-4R-FA-KL		VON

DOOR NORMALLY CLOSED AND LOCKED
 FREE EGRESS AT ALL TIMES
 ENTRY WITH VALID CREDENTIAL OR KEY OVERRIDE
 UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
 DOOR MONITORED

HARDWARE GROUP NO. 09

FOR USE ON MARK #(S):
 200/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP DEL RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 09A

FOR USE ON MARK #(S):
 100/9

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
		DESK MOUNTED PUSH BUTTON	REFERENCE HW08A		
		POWER SUPPLY	REFERENCE HW08A		

DURING OCCUPIED HOURS, DOORS (100/2 & 100/9) NORMALLY UNLOCKED BY ACCESS
 CONTROL TIME ZONE OR PUSH BUTTON
 DOORS LOCK WITH ACCESS CONTROL TIME ZONE OR DESK MOUNTED PUSH BUTTON OR
 DURESS BUTTON
 AFTER HOURS, DOORS NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES
ENTRY WITH KEY OVERRIDE OR DESK MOUNTED PUSH BUTTON OR ACCESS CONTROL TIME
ZONEUPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED

HARDWARE GROUP NO. 10

FOR USE ON MARK #(S):

101/1	103/1	104/1	105/1	107/1	108/1
202/1	A102/1	302/1		306A/1	B100/1
B101/1	B102/1	B105/1	B106/1	B107/1	B108/1
	309/1	312/1	315A/1		406/1
506/1	507/1	508/1	603/1	604/1	
701/1	704/1	706/1	708/1	708A/1	709/1
709A/1	710/1			716/1	716A/1
718/1	720/1		801/1	802/1	804/1
904/1	C102/1	C103/1	C104/1	C108/1	C109/1
	D100/1	D101/1	D102/1	D103/1	D107/1
D108/1	E100/1	E101/1	E102/1	E103/1	E104/1
E107/1	E108/1				
	908/1	909/1			

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 10A

FOR USE ON MARK #(S):

702/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	OVERHEAD STOP	100S-ADJ	630	GJ
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 10B

FOR USE ON MARK #(S):

509/1	B105C/1	C107/1	D106/1	E104C/1
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EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	TOUCH SENSOR BUTTON	TS100	628	LOCK
1	EA	PUSH PLATE	8200 6" X 16"	626	IVE
1	EA	PULL PLATE	8302 8" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP-EDA	689	LCN
1	EA	POWER SUPPLY	PS904-4R-FA-KL		VON
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	MAGNETIC LOCK	GF3000		SCE

DOOR NORMALLY CLOSED AND ELECTRIC STRIKE UNLOCKED
ENTRY WITH PASSAGE FUNCTION LEVER
WHEN IN USE, TOUCH SENSOR BUTTON @ B211A OR B211B LOCKS MAGNETIC LOCKS ON
BOTH DOORS
RELEASING TOUCH SENSOR BUTTON UNLOCKS MAGNETIC LOCKS ON BOTH DOORS
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION, MAGNETIC LOCKS AND ELECTRIC
STRIKE UNLOCK
DOORS MONITORED

HARDWARE GROUP NO. 11

FOR USE ON MARK #(S):

102/2 300/1 305/1 315C/1 C100/1
C101/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 11A

FOR USE ON MARK #(S):

102/1 310/1 606/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP REG OR PA AS NEEDED	689	LCN
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12

FOR USE ON MARK #(S):

203/1 723/2 800/1 803/1 900C/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 13

FOR USE ON MARK #(S):

018/1 611/1 709/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER

HARDWARE GROUP NO. 14

FOR USE ON MARK #(S):

306/1 308/1 404/1 600/1 605/1 711/1
715/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP EDA OR RW/PA AS REQUIRED	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 14A

FOR USE ON MARK #(S):

306/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	ELEC SURFACE CLOSER	4040SE	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 15

FOR USE ON MARK #(S):

721/1

722/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP EDA OR RW/PA AS REQUIRED	689	LCN
1	EA	OVERHEAD STOP	100S-ADJ	630	GJ
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 22

FOR USE ON MARK #(S):

B101B/1	B102B/1	B105B/1	B106B/1	B107B/1	B108B/1
C102B/1	C103B/1	C104B/1	C107/1	C108B/1	C109B/1
D101B/1	D102B/1	D103B/1	D105/1	D107B/1	D108B/1
E101B/1	E102b/1	E103B/1	E104B/1	E107B/1	E108B/1
201/1	315B/1	900B/1	904A/1		

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	9K30N15	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 23

FOR USE ON MARK #(S):

709B/1 716B/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACYSET	9K3015	626	BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 24

FOR USE ON MARK #(S):

106/1 301/1 316/1 703/1 705/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FACULTY RESTROOM	L9485HD 06A L283-722	626	SCH
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 25

FOR USE ON MARK #(S):

505A/1 910/1 601/1 602/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 26

FOR USE ON MARK #(S):

404/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	AUTO FLUSH BOLT	FB51P/61P	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	GASKETING	188S	BK	ZER
1	SET	MEETING STILE	328AA-S	AA	ZER

HARDWARE GROUP NO. 27

FOR USE ON MARK #(S):

B101A/1	B102A/1	B105A/1	B106A/1	B107A/1	B108A/1
C102A/1	C103A/1	C104A/1	C108A/1	C109A/1	
D101A/1	D102A/1	D103A/1	D107A/1	D108A/1	
E101A/1	E102A/1	E103A/1	E104A/1	E107A/1	E108A/1
405/1	407/1	501/1		718A/1	723/1
725/1	901/1	906/1	907/1	907/2	915/1
915/2					

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358/458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
2	EA	OH STOP	100S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 28

FOR USE ON MARK #(S):

008/1 408/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP HCUSH	689	LCN

2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	SET	GASKETING	870AA-S	AA	ZER
1	EA	ASTRAGAL	383AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER

HARDWARE GROUP NO. 29

FOR USE ON MARK #(S):

607/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
2	EA	OH STOP	100S	630	GLY
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	870AA-S	AA	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 30

FOR USE ON MARK #(S):

913A/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	MORTISE CYLINDER	80-132 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	GASKETING	BY ALUM DR MFG		B/O

HARDWARE GROUP NO. 31

FOR USE ON MARK #(S):

023/1 714/1 914/3

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	MORTISE CYLINDER	80-132 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA-ST2776	689	LCN
2	EA	OVERHEAD STOP	100S-ADJ	630	GJ
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	WALL STOP/HOLDER	WS495	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 31A

FOR USE ON MARK #(S):

023/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
3	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	MORTISE CYLINDER	80-132 XQ11-948	626	SCH
2	EA	DOOR PULL	VR910 DT	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	OVERHEAD STOP/HOLDER	100H	630	GJ
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 32

FOR USE ON MARK #(S):

002/1 009/2 500/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	OVERHEAD STOP	100S-ADJ	630	GJ
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

DOORS MONITORED

HARDWARE GROUP NO. 35

FOR USE ON MARK #(S):

313/1 314/1 402/1 403/1 902/1 903/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM DEAD LOCK	L463HD L283-721	626	SCH
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	PUSH PLATE	8200 6" X 16"	626	IVE
1	EA	PULL PLATE	8302 8" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 36

FOR USE ON MARK #(S):

609/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
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3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 37

FOR USE ON MARK #(S):

011/1 014/2 019/1 021/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB	689	VON
1	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
1	EA	ELEC FIRE EXIT HARDWARE	QEL-99-EO-F	626	VON
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA DEL	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830 W/EXTENSION	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05	GRY	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

DURING OCCUPIED HOURS, DOORS NORMALLY HELD OPEN
AFTER HOURS, DOORS NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR KEY OVERRIDE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOORS REMAIN LOCKED
DOORS MONITORED

HARDWARE GROUP NO. 39

FOR USE ON MARK #(S):

009/1 009/3 015/1 500/2 510/1 714/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224HD	628	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	INSTITUTION LOCK	9K37W15	626	BES
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	LOCK GUARD	LG10	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

DOORS MONITORED

HARDWARE GROUP NO. 39A

FOR USE ON MARK #(S):

608/2 906/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONT. HINGE	224HD-EPT	628	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15 EU RQE	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	LOCK GUARD	LG10	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS-KL		VON

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL KEY OVERRIDE

UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED

DOOR MONITORED

HARDWARE GROUP NO. 40

FOR USE ON MARK #(S):

B109/1	B109/2	C110/1	C110/2	D109/1	D109/2
E109/1	E109/2	999/1	999/2		

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	INSTITUTION LOCK	9K37W15	626	BES
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

DOOR MONITORED

HARDWARE GROUP NO. 41

FOR USE ON MARK #(S):

900/1	900/2
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EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

DOOR MONITORED

HARDWARE GROUP NO. 42

FOR USE ON MARK #(S):

018/2	300/2	502/1	502/2	504/1
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EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	80-132	626	SCH

HARDWARE GROUP NO. 44

FOR USE ON MARK #(S):

B101/2 315/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS-KL		VON

DOOR NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE

UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED

DOOR MONITORED

HARDWARE GROUP NO. 45

FOR USE ON MARK #(S):

503/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	VIEWER	U698	626	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER

1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	INTERCOM/REMOTE RELEASE STATION	SUPPLIED BY OTHERS		AIP
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

DOOR NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR REMOTE RELEASE OR
KEY OVERRIDE

UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED

DOOR MONITORED

HARDWARE GROUP NO. 45A

FOR USE ON MARK #(S):

718/2

720/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

DOOR NORMALLY CLOSED AND LOCKED

FREE EGRESS AT ALL TIMES

ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE

UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED

DOOR MONITORED

HARDWARE GROUP NO. 46

FOR USE ON MARK #(S):

100/1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE

1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	ELECTRIC STRIKE	6400	630	VON
1	EA	LOCK GUARD	LG10	630	IVE
1	EA	SURFACE CLOSER	4040XP	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	CREDENTIAL READER	#910NNNNEK2037P	BLK	HID
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE
1	EA	INTERCOM/REMOTE RELEASE STATION	SUPPLIED BY OTHERS		AIP

DOOR NORMALLY CLOSED AND LOCKED
FREE EGRESS AT ALL TIMES
ENTRY WITH VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE OR
REMOTE RELEASE
UPON LOSS OF POWER OR FIRE ALARM ACTIVATION DOOR REMAINS LOCKED
DOOR MONITORED

HARDWARE GROUP NO. 49

FOR USE ON MARK #(S):

914/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	80-159	626	SCH
1	EA	MORTISE CYLINDER	80-132 XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	DOOR BOTTOM	369AA	AA	ZER
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 50

FOR USE ON MARK #(S):

022/1

022/2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB	689	VON

2	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
1	EA	PULL	VR910NL	630	IVE
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	80-132	626	SCH
2	EA	SURFACE CLOSER	4040XP 306/1	689	LCN
			EDA		
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

MAGNETIC HOLD OPENS TO BE TIED TO FIRE ALARM SYSTEM AND RELEASE UPON ACTIVATION OF FIRE ALARM.

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites, storefront framing, and glazed curtain walls.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for system performance requirements.
 - 2. Section 08 44 13 "Glazed Aluminum Curtain Walls" for system performance requirements.
 - 3. Section 08 56 53 "Security Windows."
 - 4. Section 08 88 13 "Fire-Resistant Glazing."
 - 5. Section 08 88 56 "Ballistics-Resistant Glazing."

1.3 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 according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

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

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.
 1. MR Credit 2: BPDO – Environmental Product Declarations.
 - a. For glass, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 4: BPDO – Material Ingredients.
 - a. For glass, if available: Material Ingredient Report.
 3. EQ Credit 2: Low-Emitting Materials.
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 4. EQ Credit 7: Daylight.
 - a. For all exterior glazing: Visible light transmittance value.
- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: For glass.
- C. Product Test Reports: For tinted glass, coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency.
 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" and Section 08 51 13 "Aluminum Windows" to match glazing systems required for Project, including glazing methods.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to 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.

1.10 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 (4.4 deg C).

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Guardian Glass: SunGuard.
 2. Oldcastle BuildingEnvelope™.
 3. Pilkington North America.
 4. Vetrotech Saint-Gobain.
 5. Vitro Architectural Glass.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
1. Obtain tinted glass from single source from single manufacturer.
 2. Obtain reflective-coated glass from single source from single manufacturer.
 3. Obtain laminated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
1. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
 2. Visible Light Transmittance: Minimum 55%.
- B. 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

the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.
- D. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 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 (25 mm), whichever is less.
- E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- F. 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, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 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. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 - 4. 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. 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 IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- 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.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- D. Fully Tempered One-Way Mirror Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition C (other coated glass) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. Pyrolytic one-way mirror coating complying with ASTM C 1376.
- E. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.8 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 C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of 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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 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.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 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 come into 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.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type GL-1: Clear annealed float glass.
 - 1. Minimum Thickness: 6 mm.
- B. Glass Type GL-2 Clear heat-strengthened float glass.
 - 1. Minimum Thickness: 6 mm.
- C. Glass Type GL-3 (**TEMP**): Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.
- D. Glass Type GL-5: One-way mirror fully tempered float glass.
 - 1. Basis-of-Design Product: Pilkington; Mirrorpane.
 - 2. Minimum Thickness: 6 mm.
 - 3. Safety glazing required.

3.9 LAMINATED GLASS SCHEDULE

- A. Glass Type GL-4 (**LAM**): Clear laminated glass with two plies of annealed float glass.
 - 1. Basis-of-Design Product: Oldcastle Building Envelope; Safety & Burglary Laminated Safety Glazing.
 - 2. Minimum Thickness of Each Glass Ply: 3 mm.
 - 3. Interlayer Thickness: 0.060 inch (1.52 mm).
 - 4. Safety glazing required.

3.10 INSULATING GLASS SCHEDULE

A. Glass Type **IG-1**: Low-E-coated, tinted insulating glass.

1. Basis-of-Design Product: PPG; Solarban 60 (2) Solargray + Clear.
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: 90% Argon, 10% Air.
6. Indoor Lite: Fully tempered float glass.
7. Low-E Coating: Sputtered on second surface.
8. Winter Nighttime U-Factor: 0.25 maximum.
9. Visible Light Transmittance: 35 percent minimum.
10. Solar Heat Gain Coefficient: 0.24 maximum.
11. Cradle-to-Cradle (C2) Certification: Silver.
12. Safety glazing required.

B. Glass Type **IG-2** (Aquatics area): Low-E-coated, clear insulating glass.

1. Basis-of-Design Product: PPG; Solarban 60 (2) Solargray + Clear + Clear.
2. Overall Unit Thickness: 1-7/16 inch (36.5 mm).
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: 90% Argon, 10% Air.
6. Indoor Lite: Fully tempered float glass.
7. Low-E Coating: Sputtered on second surface.
8. Winter Nighttime U-Factor: 0.21 maximum.
9. Visible Light Transmittance: 32 percent minimum.
10. Solar Heat Gain Coefficient: 0.24 maximum.
11. Cradle-to-Cradle (C2) Certification: Silver.
12. Safety glazing required.

END OF SECTION 08 80 00

**SECTION 088113
DECORATIVE GLASS GLAZING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Decorative laminated glass, including framing system.

1.3 DEFINITION

- A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For the following products, 6 inches (150 mm) square:
 - 1. Each type of decorative glass.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of decorative glass to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under NGA's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect decorative glass and glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Retain packaging and sequencing numbers for decorative-glass units.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install decorative glass until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings and construction contiguous with decorative glass by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

- 1. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3form, Inc.
 - 2. AGC Glass Company North America, Inc.
 - 3. Guardian Glass; SunGuard.
 - 4. Pilkington North America.
 - 5. Vetrotech Saint-Gobain.
 - 6. Vitro.
- B. Source Limitations for Glass: Obtain each type of decorative glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer, for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Decorative glass installed adjacent to walking surfaces shall withstand the following design loads within limits and under conditions indicated:
 - 1. Differential deflection of adjacent unsupported edges shall not exceed glass thickness when subjected to 50 lbf/ft. (730 N/m) applied horizontally to one panel at any point up to 42 inches (1067 mm) above the adjacent walking surface.
 - 2. Base design on thickness at thinnest part of the glass.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers, GANA's "Laminated Glazing Reference Manual," and "GANAs "Glazing Manual" unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 - 1. Locate safety glazing labeling in clear portion of decorative glazing unit, in consistent location and orientation when installed.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- D. 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 requirements indicated. Where heat-strengthened glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with requirements indicated. Where fully tempered glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultraclear Float Glass: ASTM C1036, Type I, Class I, Quality-Q3, and with visible light transmission not less than 91 percent.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. AGC Glass Company North America, Inc.; Krystal Klear.
 - b. Guardian Glass; SunGuard; UltraWhite.
 - c. Pilkington North America; Optiwhite.

- d. Vetrotech Saint-Gobain.
 - e. Vitro Architectural Glass; Starphire.
- C. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.
- D. Fully Tempered 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.
- 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- E. Heat-Strengthened Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- F. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

2.5 GLAZING MATERIALS

- A. Glazing Sealants, Tapes, and Miscellaneous Glazing Materials: As specified in Section 08 80 00 "Glazing."
- 1. Colors: As selected by Architect from manufacturer's full range.

2.6 HARDWARE FOR GLASS INSTALLATION

- A. Hardware: Modular, extruded aluminum frames installed into continuous perimeter track .
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide 3form, Inc.; FRAME architectural partition system or a comparable product by one of the following:
 - a. C.R. Laurence Co., Inc.
 - b. EPCO, Engineered Products Co.
 - c. Gyford Productions, LLC.
 - d. KL-Megla America.
 - e. Sugatsune America, Inc.
 - f. Product recommended in writing by approved decorative glazing panel manufacturer.
 - 2. Material and Finish: Clear anodized aluminum.
 - 3. Face Dimension: 2-1/8 inches for exposed edge and intermediate frames and 2-3/4 inches for top and bottom tracks.
- B. Fasteners: Fabricated of stainless steel or same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Gaskets: Manufacturer's standard, compatible with decorative glass type indicated.

- D. Anchors and Inserts: Provide devices as required for hardware installation. Provide stainless-steel expansion-bolt devices for drilled-in-place anchors and inserts.

2.7 DECORATIVE-GLASS FABRICATION

- A. Fabricate decorative glass and provide other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with product manufacturer's written instructions and with referenced glazing standard.
- B. Edge Finishing: Finish edges smooth and polished, without chips, scratches, or warps.
 - 1. Finished Edge: Clean cut or flat grind vertical edges of butt-glazed lites in a manner that produces square edges with slight kerfs.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Set decorative-glass units in each series true in line with uniform orientation, pattern, draw, bow, and similar characteristics.
- B. Set glass lites with proper orientation so that each outer surface faces the same direction.
- C. Set decorative glass in locations indicated on Drawings. Install glass with hardware and accessories according to hardware manufacturer's written instructions. Attach hardware securely to mounting surfaces.

3.4 GLAZING, GENERAL

- A. Decorative Glass: Install glazing as specified in Section 08 80 00 "Glazing."
- B. Comply with combined written instructions of manufacturers of glass, gaskets, sealants, tapes, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is more than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances, and to comply with system performance requirements.
 - 2. Provide 1/8-inch- (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.5 HARDWARE INSTALLATION

- A. Install architectural partition support hardware in accordance with manufacturer's written instructions.
- B. Attach top and bottom frames to supporting structure with stainless steel screws spaced no more than 24 inches on center and 2 to 6 inches from edges of opening. Attach side frames with screws spaced as recommended in writing by hardware manufacturer.
- C. Install glazed modules onto frames, starting from one side and inserting joiners between modules.
- D. Level modules within opening to within 1/16 inch of each other, and lock modules into place.
- E. Install closures, trim, and valances.

3.6 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. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 DECORATIVE GLASS SCHEDULE

- A. Decorative Glass Type HRG-1: Laminated glass.
 - 1. Basis-of-Design Product: 3form, Inc.; High Res Pressed glass panel, graphic patterns, Skydive B48 Gradient inverse pattern, with FRAME support system.
 - 2. Construction: Two plies of ultraclear, heat-strengthened float glass.
 - 3. Thickness of Each Glass Ply: 4 mm.
 - 4. Construction: Laminate glass with PVB interlayer or cast-in-place and cured, transparent, resin interlayer to comply with interlayer manufacturer's written instructions.
 - 5. Interlayer Thickness: 0.030 inch (0.76 mm) minimum.
 - 6. Safety glazing required.

END OF SECTION 08 81 13

**SECTION 08 83 00
MIRRORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Tempered glass mirrors qualifying as safety glazing.
- B. Related Requirements:
 - 1. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials.
 - a. For interior wet-applied mastics: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
- C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- D. Samples: For each type of the following:
 - 1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
 - 2. Mirror Clips: Full size.
 - 3. Mirror Trim: 12 inches (300 mm) long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.

- B. Product Certificates: For each type of mirror and mirror mastic.
- C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's (GANA) Certified Glass Installer Program.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.
 - 1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors, as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

- 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. LEED Requirements:

1. Interior wet-applied mastics: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.2 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by a manufacturer who is a Mirror Division member firm of GANA.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

2.3 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503.
- B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
 1. Nominal Thickness: 6.0 mm.
- C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.4 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.5 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom and Side Trim: L-bars formed with back leg not less than 7/8 inch (22 mm) in height, and a thickness of not less than 0.04 inch (1.0 mm).
 2. Finish: Clear bright anodized.
- B. Mirror Top Clips: As indicated.
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.6 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Rounded polished.
1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating, where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 - 1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum L-bars: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00

**SECTION 08 88 13
FIRE-RESISTANT GLAZING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-resistance-rated glazing.

1.3 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 according to ASTM C 1036.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials.
 - a. For interior wet-applied sealants and sealant primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - 2. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For glass, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 3. MR Credit 4: BPDO – Material Ingredients

- a. For glass, if available: Material Ingredient Report.
 - C. Glass Samples: For each type of glass product; 12 inches (300 mm) square.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Product Certificates: For each type of glass and glazing product, from manufacturer.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- 1.9 FIELD CONDITIONS
- A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.
- 1.10 WARRANTY
- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.
 - B. Manufacturer's Special Warranty on Double Glazing Units with Clear Gel Fill: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of double glazing units with clear gel fill is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass, contrary to manufacturer's written instructions. Evidence of failure is the leakage of gel fill from units, air bubbles within units, or obstruction of vision by contamination or deterioration of gel.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.
- C. Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass, as installed unless otherwise indicated.
- D. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-RESISTANCE-RATED GLAZING

- A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing according to ASTM E 119 or UL 263.
- B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.
- C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - a. AGC Glass Company North America, Inc.; Pyrobel.
 - b. Pilkington North America; Pyrostop.
 - c. SAFTI FIRST Fire Rated Glazing Solutions; SuperLite II-series.
 - d. Technical Glass Products; Pyrostop.
 - e. Vetrotech Saint-Gobain; SGG Contraflam.
- D. Double Glazing Units with Clear Gel Fill: Double glazing units made from two lites of uncoated, fully tempered, ultraclear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent gel; and complying with 16 CFR 1201, Category II.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. AGC Glass Company North America, Inc.
 - b. Pilkington North America.
 - c. SAFTI FIRST Fire Rated Glazing Solutions.
 - d. Technical Glass Products.
 - e. Vetrotech Saint-Gobain.

2.6 GLAZING ACCESSORIES

- A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

1. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- C. 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 C 1281 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.
- D. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- C. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 GLAZING, GENERAL

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
- B. 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.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately, as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces in each area of Project not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Wash glass, as recommended in writing, by glass manufacturer.

3.6 FIRE-RESISTANCE-RATED GLAZING SCHEDULE

- A. Glass Type **FRGL-1**: 90-minute fire-resistance-rated glazing with 450 deg F (250 deg C) temperature-rise limitation; laminated glass with intumescent interlayers or double glazing units with clear gel fill.

END OF SECTION 08 88 13

SECTION 08 88 56
BALLISTICS-RESISTANT GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glass-clad polycarbonate for the following applications:
 - 1. Doors.
 - 2. Glazed entrances.
 - 3. Storefront framing.
- B. Related Requirements:
 - 1. Section 08 34 53 "Security Doors and Frames."

1.3 DEFINITIONS

- A. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated ballistics-resistant glazing, as defined in referenced glazing publications.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on ballistics-resistant glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for ballistics-resistant glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.

1. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied glazing sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For glazing sealant installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.
- C. Ballistics-Resistant Glazing Samples: For each type of ballistics-resistant glazing; 12 inches (300 mm) square.
- D. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two (2) strips of material representative in color of the adjoining framing system.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers.
- B. Product Certificates: For each type of product indicated, from manufacturer.
- C. Product Test Reports: For each type of ballistics-resistant glazing, for tests performed by a qualified testing agency.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glazing installers for this Project who are certified under the National Glass Association Glazier Certification Program.
- B. Ballistics-Resistant Glazing Testing Agency Qualifications: Subject to compliance with requirements, testing agency is one of the following:
 - 1. H. P. White Laboratory, Inc.
 - 2. Underwriters Laboratories, Inc.
 - 3. Wiss, Janney, Elstner Associates, Inc.
- C. Sealant Testing Agency Qualifications: Qualified according to ASTM C1021 for testing indicated.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each ballistics-resistant glazing type, tape sealant, gasket, glazing accessory, and glazing-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing will not be required if data based on previous testing of current sealant products and glazing materials match those submitted.
 - 2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to ballistics-resistant glazing, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than two (2) samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

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

1.11 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 below 40 deg F (4.4 deg C).

1.12 WARRANTY

- A. Manufacturer's Special Warranty for Glass-Clad Polycarbonate: Manufacturer agrees to replace glass-clad polycarbonate that deteriorates within specified warranty period. Deterioration of glass-clad polycarbonate is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning glass-clad polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
 1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Ballistics-Resistant Glazing: Obtain ballistics-resistant glazing from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each ballistics-resistant glazing type indicated.
- B. Source Limitations for Glazing Sealants and Gaskets: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. Installed ballistics-resistant glazing shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing; or other defects in construction.
2. Installed ballistics-resistant glazing shall withstand ballistics-related loads and forces without damage to the glazing beyond that allowed by referenced standards.

B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 SECURITY GLAZING, GENERAL

A. Glazing Publications: Comply with published recommendations of ballistics-resistant glazing and glazing material manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.

C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.

D. Fire-Test-Response Characteristics of Polycarbonate Sheets: As determined by testing polycarbonate sheets identical to those used in ballistics-resistant glazing products by a qualified testing agency acceptable to authorities having jurisdiction.

1. Self-ignition temperature of 650 deg F (343 deg C) or more when tested according to ASTM D1929 on plastic sheets in thicknesses indicated for the Work.
2. Smoke-Developed Index of 450 or less when tested according to ASTM E84, or smoke density of 75 or less when tested according to ASTM D2843 on plastic sheets in thicknesses indicated for the Work.
3. Burning extent of 1 inch (25 mm) or less when tested according to ASTM D635 at a nominal thickness of 0.060 inch (1.52 mm) or thickness indicated for the Work.

2.4 GLASS PRODUCTS

A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2. For heat-strengthened float glass, comply with requirements for Kind HS.
3. For fully tempered float glass, comply with requirements for Kind FT.
4. For uncoated glass, comply with requirements for Condition A.
5. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.5 POLYCARBONATE SECURITY GLAZING

- A. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on exposed surfaces and Type I, standard, UV-stabilized polycarbonate where no surfaces are exposed.
- B. Glass-Clad Polycarbonate: ASTM C1349.
- C. Laminated Glass and Polycarbonate: ASTM C1349.

2.6 SPALL-RESISTANT FILM

- A. Spall-Resistant Film: Composite of clear polyvinyl butyral film and clear abrasion-resistant polyester film.
- B. Laminating Process: Factory laminate spall-resistant film to glazing assemblies to produce laminated lites free of foreign substances, air, and glass pockets.

2.7 GLAZING SEALANTS

- A. General:
 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including ballistics-resistant glazing, seals of insulating ballistics-resistant glazing and air-gap ballistics-resistant glazing, 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 ballistics-resistant glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
 4. Interior wet-applied sealants primers and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT.
 1. Products: Subject to compliance with requirements and written recommendation of ballistics-resistant glazing manufacturer, provide one of the following:
 - a. Dow Corning Corporation; Dow Corning® 795 Silicone Building Sealant.
 - b. Pecora Corporation; 895NST.
 - c. Sika Corporation; Sikasil WS-295.
 - d. Other sealant recommended in writing by glazing manufacturer.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod, as recommended in writing by tape and ballistics-resistant glazing manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of ballistics-resistant glazing 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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by ballistics-resistant glazing manufacturer to maintain ballistics-resistant glazing lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit ballistics-resistant glazing lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF SECURITY GLAZING

- A. Fabricate ballistics-resistant glazing 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. Grind smooth and polish exposed ballistics-resistant glazing edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving ballistics-resistant glazing 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 will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of ballistics-resistant glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect edges of ballistics-resistant glazing from damage during handling and installation. Remove damaged ballistics-resistant glazing from Project site and legally dispose of off Project site. Damaged ballistics-resistant glazing includes units with edge or face damage or other imperfections that, when installed, could weaken ballistics-resistant glazing and impair performance and 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 glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by ballistics-resistant glazing manufacturers for installing lites.
- F. Provide spacers for ballistics-resistant glazing lites where the length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of ballistics-resistant glazing. 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 performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glazing lites 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 ballistics-resistant glazing from moving sideways in glazing channel, as recommended in writing by ballistics-resistant glazing manufacturer and according to requirements in referenced glazing publications.
- H. Set ballistics-resistant glazing in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- 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 by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by ballistics-resistant glazing, 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 and then to jambs. Cover horizontal framing joints by applying tapes to jambs and 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 just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center ballistics-resistant glazing 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.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket securely in place between glazing unit and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

- C. Installation with Drive-in Wedge Gaskets: Center ballistics-resistant glazing in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in ballistics-resistant glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center ballistics-resistant glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in ballistics-resistant glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect ballistics-resistant glazing from contact with contaminating substances resulting from construction operations, including weld splatter. 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 come into contact with ballistics-resistant glazing, remove substances immediately, as recommended in writing by ballistics-resistant glazing manufacturer. Remove and replace ballistics-resistant glazing that cannot be cleaned without damage.
- C. Wash ballistics-resistant glazing on both exposed surfaces in each area of Project not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Wash ballistics-resistant glazing, as recommended in writing by ballistics-resistant glazing manufacturer.

3.7 GLASS-CLAD POLYCARBONATE SECURITY GLAZING SCHEDULE

- A. Ballistics-Resistant Glazing Type **SG-1**: Clear glass-clad polycarbonate with abrasion resistant coating to glass layer on secure side.
 - 1. Products: Subject to compliance with requirements and listing in an assembly with security doors and frames, provide products by one of the following:
 - a. Armortex.
 - b. Oldcastle.
 - c. Secur-Tem.
 - 2. Ballistic Resistance: Level 4 according to UL 752.
 - 3. Maximum Overall Unit Thickness: 1.25 inches.
 - 4. Overall Visible Light Transmittance: 65 percent minimum.
 - 5. Weight: 14 pounds per square foot.
 - 6. Provide safety glazing labeling.

END OF SECTION 08 88 56

SECTION 08 91 19
FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed extruded-aluminum louvers.
 - 2. Blank-off panels for louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content louvers: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. MR Credit 4: BPDO – Material Ingredients
 - a. a. For louvers, if available: Material Ingredient Report.

- C. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- D. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M.

1.7 FIELD CONDITIONS

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

1.8 WARRANTY

- A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on pressures, as indicated on Drawings.
- B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS (LV-#)

- A. Horizontal, Wind-Driven-Rain-Resistant Louver:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Airolite Company, LLC (The); SCH501.
 - b. All-Lite Architectural Products; ECD-545.
 - c. Construction Specialties, Inc.; RSH-5700.
 - d. Greenheck Fan Corporation; EHH-501.
 - e. Ruskin Company; EME520DD.
 - 2. Louver Depth: 5 inches (127 mm).
 - 3. Height and Width: As indicated on Mechanical Drawings.
 - 4. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
 - 5. Louver Performance Ratings:
 - a. Free Area: Not less than 6.8 sq. ft. (0.63 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
 - b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s) free-area intake velocity.
 - c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 8 inches (200 mm) per hour and a wind speed of 50 mph (22.4 m/s) at a core-area intake velocity of 400 fpm (2.0 m/s).
 - 6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Bird screening, aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.60-mm) wire
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
1. Metal: Same type and form of metal, as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Same finish as louver frames to which louver screens are attached.
 3. Type: Non-rewirable, U-shaped frames.

2.5 BLANK-OFF PANELS

- A. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
1. Thickness: 2 inches (50 mm).
 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
 3. Insulating Core: Extruded-polystyrene foam.
 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch (2.03-mm) nominal thickness, with corners mitered and with same finish as panels.
 5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
 6. Panel Finish: Same type of finish applied to louvers, but black color.
 7. Attach blank-off panels with clips.

2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005, with temper, as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless-steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E 488/E 488M conducted by a qualified testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
 - 1. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades, so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
- G. Provide subsills made of same material as louvers for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
 - 1. Color and Gloss: Match metal wall panel MWP-1 in Section 07 42 13.13 "Formed Metal Wall Panels."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, 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.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Non-bearing framing on interior of building.
- B. Framing for installation of ceilings and bulkheads to receive gypsum board except those that will be load-bearing, which must be engineered.

1.2 RELATED SECTIONS

- A. Section 01 74 19: Construction Waste Management and Disposal
- B. Section 01 81 13: Sustainable Design Requirements
- C. Section 09 29 00: Gypsum Board

1.3 SUBMITTALS

- A. Submit manufacturer's literature for all materials and installations. Indicate limiting heights and deflection allowance for all stud types to be used. Include UL certification information for products to be used in fire rated assemblies.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For steel framing: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel framing and suspension systems: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include statement indicating material cost for each product having recycled content.
 - b. For regionally sourced steel framing: Submit invoices and documentation showing manufacturing locations and origins of component materials for products that have been manufactured within a 100-mile radius of the project site. Where product is made up of multiple components, indicate the extraction, harvest, or recovery location of each component and the weight of each component. Include statement indicating material cost for each regionally manufactured product.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For steel framing and suspension systems, if available: Material Ingredient Report.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Metal Framing: All steel products should contain a minimum of 25% postconsumer recycled content. Deflection limitations for framing shall be L/240.
 - 1. Lightgage Metal Framing (for interior non-load bearing gypsum wallboard wall systems): Heavy duty drywall steel studs, dimensions as indicated on the drawings, 20 gauge minimum, ASTM C645, by Clark-Dietrich, Marino\Ware, or Nucor. The gauge of all metal studs to receive gypsum board shall be sized so that the deflection of the wall shall not exceed L/240 per ASTM C645 and ASTM C754 unless a heavier gauge is indicated on the wall type or details. Provide bridging, accessories and fasteners as indicated on the drawings or as required by job conditions. Provide track to match steel stud size and gauge. Provide slip/deflection track for walls extending to roof deck above. Provide firestop track as required for rated wall assemblies. Provide ASTM A653 galvanized coating, minimum yield of 33 ksi.
 - 2. Cold Rolled Channels: Roll formed, channel-shaped sections of minimum 16 gauge galvanized steel, size 17/32" x 2.
 - 3. Metal Furring Channels: Roll formed, hat-shaped sections of minimum 20 gauge galvanized steel, size 0.875" x 2.75" or 1.5" x 2.75" as indicated on the drawings.
 - 4. Furring Channel Clips: Galvanized wire clips, used for fastening metal furring channels and rolled sections
- B. Fasteners: 1-1/2" GWB-54 annular ringed nails or 1-1/4" drywall screws, Type W with phillips head.
- C. Provide tie wire and hangers as required by job conditions, ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
- D. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content.
- E. Regional Materials: Provide at least 25 percent of steel framing manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install metal framing as indicated on the drawings and in compliance with manufacturer's instructions, securely attaching track to structure as indicated on the drawings, and studs to track at 16" on center, unless otherwise noted. Provide slip/deflection track for all walls extending to roof deck above.
- B. Install suspension systems and hangers per manufacturer's recommendations, install those requiring attachment to metal deck or steel beams to receive sprayed fire-resistive materials prior to fireproofing application. Ceiling suspension systems may not be hung from metal roof. Intermediate supports must be provided between main structural members for suspension of ceiling framing. Coordinate the location of hangers with other work.
- C. Finished surfaces shall be smooth, uniform and ready to receive architectural finishes and decoration. Protect finished surfaces, and repair damaged work to the satisfaction of the Architect.

3.2 CLEAN-UP

- A. At the completion of the job, remove all excess materials from the site.

- END OF SECTION 09 22 16 -

SECTION 09 29 00
GYPSUM BOARD

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Gypsum board.
- B. Taped and sanded joint treatment.
- C. Include all labor, materials, appliances and services necessary to complete all gypsum wallboard and related work required by the drawings and/or described in this specification.

1.2 RELATED SECTIONS

- A. Section 01 74 19 – Construction Waste Management and Disposal.
- B. Section 01 81 13 – Sustainable Design Requirements.
- C. Section 05 40 00 – Cold Formed Metal Framing.
- D. Section 09 22 16 – Non-Structural Metal Framing.
- E. Section 09 30 00 – Tiling.
- F. Section 09 90 00 – Painting and Coating.

1.3 PRODUCTS FINISHED BUT NOT SUPPLIED UNDER THIS SECTION

- A. Section 06 26 14 - Mineral Profile Paneling.

1.4 REFERENCES

- A. ASTM C36 - Gypsum Wallboard.
- B. ASTM C475- Joint Treatment Materials for Gypsum Wallboard Construction.
- C. ASTM C514- Nails for the Application of Gypsum Wallboard.
- D. ASTM C645- Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board.
- E. ASTM C754- Installation of Framing Members to Receive Screw Attached Gypsum Wallboard.
- F. ASTM C840- Application and Finishing of Gypsum Board.
- G. ASTM C1002- Steel Drill Screws for the Application of Gypsum Board.
- H. GA-201- Gypsum Board for Walls and Ceilings.
- I. GA-216- Recommended Specifications for the Application and Finishing of Gypsum Board.

1.5 SUBMITTALS

- A. Submit under provisions of Division 1.

- B. Product Data: Provide data on gypsum board, joint tape, fasteners and accessories. Clearly label the location/application for use of each type of proposed gypsum board product.
- C. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For gypsum board and steel framing: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content gypsum board: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include statement indicating material cost for each product having recycled content.
 - b. For regionally sourced gypsum board: Submit invoices and documentation showing manufacturing locations and origins of component materials for products that have been manufactured within a 100-mile radius of the project site. Where product is made up of multiple components, indicate the extraction, harvest, or recovery location of each component and the weight of each component. Include statement indicating material cost for each regionally manufactured product.
 - c. For manufacturers with extended producer responsibility programs: Documentation describing the program and confirmation that product is included in the program.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For gypsum board, sound attenuation blanket, joint compound, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For gypsum board and insulation installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Drywall Construction Handbook published by United Gypsum Company.
- B. Comply with applicable ASTM Standards.

1.7 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience.
- B. Finishers who will be finishing seams of dimensional wall panels specified in Section 06 26 14 shall have a minimum of 3 years documented experience with finishing similar products.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. National Gypsum Company.
- B. United States Gypsum Company.

C. Georgia Pacific Corporation.

2.2 GYPSUM BOARD MATERIALS

A. Hi-Impact Gypsum Board: For use up to 6" minimum above finished ceiling height in areas with finished ceilings or to 10'-0" minimum above finished floor in areas with exposed structure ceilings. ASTM C1396 and C1278; 5/8-inch-thick, Fire Shield type "X" core, maximum permissible length; ends square cut, tapered edges, Underwriters Laboratories Approved. Surface Abrasion Resistance: Classification Level 3 in accordance with ASTM C 1629. Indentation Resistance: Classification Level 1 in accordance with ASTM C 1629. Soft Body Impact Resistance: Classification Level 3 in accordance with ASTM C 1629. Hard Body Impact Resistance: Classification Level 3 in accordance with ASTM C 1629. Mold/mildew resistance panel score of 10 when tested in accordance with ASTM D3273.

1. Basis-of-Design: Gold Bond Hi-Impact XP Fire-Shield Gypsum Board by National Gypsum.

B. Moisture Resistant Gypsum Board: For use from top of Hi-Impact product to top of wall or underside of structure. ASTM C1396 and C1278; 5/8-inch-thick, Fire Shield type "X" core, maximum permissible length; ends square cut, tapered edges, Underwriters Laboratories Approved. Mold/mildew resistance panel score of 10 when tested in accordance with ASTM D3273.

1. Basis-of-Design: Gold Bond XP Fire-Shield Gypsum Board by National Gypsum.

2.3 ACCESSORIES

A. Corner Beads and Casing Bead: recessed galvanized metal requiring finish with joint compound. Minimum steel thickness 0.014" and in compliance with ASTM C1047.

B. Joint Materials: ASTM C475, GA-201 and GA-216; reinforcing tape, joint compound, adhesive and water. All adhesives for indoor use shall comply with the VOC limits of South Coast Air Quality District Rule #1168. Adhesive VOC limit shall be 50 g/L. Provide products designed to resist moisture and humidity for use with moisture resistant gypsum board.

C. Control Joints: Bent zinc sheet formed with V shaped slot, covered with plastic tape, with perforated flanges and complying with ASTM C 1047.

D. Expansion Joints: USG Control Joint #093 – provide at all areas where new construction abuts existing.

2.4 LEED CRITERIA

A. Recycled Content: Provide regular gypsum board with minimum 80 percent recycled content, including recycled content face paper; provide steel with at least 25 percent post-consumer recycled content.

B. Regional Materials: If necessary to meet required LEED threshold, provide gypsum board manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

C. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

D. Gypsum board and insulation installed within the building interior: Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work.

3.2 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA-201, GA-216, GA-600 and manufacturer's instructions. Install and finish board per ASTM C840.
- B. Erect single layer standard gypsum board in most economical direction with ends and edges occurring over firm bearing.
- C. Use screws when fastening gypsum board to metal furring or framing.
- D. Treat cut edges and holes in moisture resistant gypsum board with sealant.
- E. Place control joints consistent with lines of building spaces as directed. Provide control joints spaced no further than 30'-0" O/C, typical. Provide vertical control joints at edges of door frames.
- F. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- G. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.
- H. Erect exterior gypsum soffit boards perpendicular to supports, with staggered end joints over supports.
- I. Treat cut edges and holes in exterior gypsum soffit board with sealant.

3.3 JOINT TREATMENT

- A. Tape, fill and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- C. Finish all areas to receive ceramic tile to a level 2 finish. All other areas shall be finished to a level 4 finish, except for accent walls, which shall be finished to a level 5 finish.
- D. Finish seams in Mineral Profile Panels according to panel manufacturer's finishing instructions. See Section 06 26 14.

3.4 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

- END OF SECTION 09 29 00 -

SECTION 09 30 00
TILING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Ceramic tile wall, wainscot and base finishes using the thinset application method.

1.2 RELATED SECTIONS

- A. Section 01 23 00: Alternates
- B. Section 01 74 19: Construction Waste Management and Disposal
- C. Section 01 81 13: Sustainable Design Requirements
- D. Section 04 20 00: Unit Masonry
- E. Section 07 92 00: Joint Sealants
- F. Section 09 29 00: Gypsum Board

1.3 REFERENCES

- A. ANSI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.
- B. ANSI A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
- C. ANSI A108.10 - Installation of Grout in Tilework.
- D. ANSI A118.1 - Dry-Set Portland Cement Mortar.
- E. ANSI A118.4 - Latex Portland Cement Mortar.
- F. ANSI A118.6 - Ceramic Tile Grouts.
- G. ANSI A137.1 - Standard Specifications for Ceramic Tile.
- H. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.
- C. Product Data: Provide instructions for using adhesives and grouts.
- D. Samples: Chart indicating full line of manufacturer's tile and grout color options for selection by architect. Once colors are selected submit two (2) samples of all tiles and grouts for color selection by Architect for final approval.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
- F. Submit letter of acceptance of grout and adhesive from tile manufacturer.

G. LEED Submittals: Comply with Section 018113.

1. MR Credit 2: BPDO – Environmental Product Declarations

a. For tile and grout, if available: Industry-wide or product-specific EPD.

2. MR Credit 3: BPDO – Sourcing of Raw Materials

a. For recycled content tile and cement board: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

3. MR Credit 4: BPDO – Material Ingredients

a. For grout, underlayment, cement board, and waterproofing membrane, if available: Material Ingredient Report.

4. EQ Credit 2: Low-Emitting Materials

a. For interior wet-applied adhesive, grout, grout sealer, sealants, primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

b. For cement board, underlayment, and waterproofing membrane installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.

1.5 MAINTENANCE DATA

A. Submit under provisions of Division 1.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with all applicable portions of ANSI Standard Specifications for tile work.

B. Conform to TCA Handbook.

C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum five years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

- B. Maintain a minimum of 50 degrees F during and for 3 days after installing tile and grout.

1.10 EXTRA MATERIALS

- A. Furnish under provisions of Division 1.
- B. Provide two boxes of each size, color, and surface finish of tile specified.

1.11 WARRANTY

- A. Provide 2-year warranty to cover workmanship and material defects.

PART 2 – PRODUCTS

2.1 TILE MANUFACTURERS

- A. Crossville, Inc. (Basis-of-Design for CT-1 and CT-2 – Other manufacturers must be able to provide suitable color match to be deemed acceptable).
- B. Interceramic (Basis-of-Design for PBT-1 – Other manufacturers must be able to provide suitable color match to be deemed acceptable).
- C. Dal-Tile (Basis-of-Design for CT-3) – Other manufacturers must be able to provide suitable color match to be deemed acceptable).
- D. American Olean Tile Co.

2.2 TILE MATERIALS

- A. CT-1 Wall Tile: Crossville Inc., Retro Active 2.0 Porcelain Stone Tile or equal by manufacturer listed above, compliant with ANSI A137.1 and conforming to the following:
 - 1. Size 4" x 12" x 5/16"
 - 2. Water Absorption < 0.2%
 - 3. Shape Rectangle
 - 4. Color RET04 – Empress White, PO - polished
 - 5. Pattern None
- B. CT-2 Wall Tile: Crossville Inc., Retro Active 2.0 Porcelain Stone Tile or equal by manufacturer listed above, compliant with ANSI A137.1 and conforming to the following:
 - 1. Size 4" x 12" x 5/16"
 - 2. Moisture Absorption < 0.2%
 - 3. Shape Rectangle, bullnose trim
 - 4. Color RET01 – Antico Taupe, PO - polished
 - 5. Pattern See Drawings
- C. CT-3 Wall Tile: Daltile, Natural Hues Glazes ceramic or equal by manufacturer listed above, compliant with ANSI A137.1 – 2012 and conforming to the following:

1. Size: 4" x 8" x 5/16"
2. Water Absorption < 6.0%
3. Shape Rectangle
4. Colors TBD
5. Pattern None

D. PBT-1 Tile Base: Crossville Inc., Retro Active 2.0 Porcelain Tile or equal manufacturer listed above, compliant with ANSI A137.1 and conforming to the following:

1. Size 4" x 12" x 5/16"
2. Moisture Absorption < 0.2%
3. Shape Rectangle, cove base with bullnose top edge
4. Colors ROT01 – Antico Taupe, PO - polished
5. Pattern None

2.3 SETTING MATERIALS

A. Approved by Tile Manufacturer

B. Porcelain Ceramic Wall Tile (Thin-set at masonry walls per TCA Method W202 or at stud walls per TCA Method W244C):

1. Mortar: Portland Cement with Latex Additive; Thin-Set – for all areas without waterproofing membrane. (At areas to receive waterproofing membrane, provide either ANSI A118.1 or A118.4 mortar as recommended by membrane manufacturer.)
 - a. Description: Latex additive and site mixed portland cement mortar. Complying with ANSI A118.4.
 - b. Quantity: As recommended by latex additive manufacturer.
2. Water: Potable
3. Grout: Polymer modified; comply with ANSI A118.7.

E. All setting materials are to comply with the VOC limits of South Coast Air Quality District Rule #1168.

2.4 GROUT MIX

A. Mix and proportion pre-mix grout materials in accordance with manufacturer's instructions and TCA Handbook. Basis-of-Design: Mapei or Laticrete.

2.5 LEED REQUIREMENTS

A. Adhesives, grout, grout sealer, sealants, and primers applied within the building waterproofing envelope: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

- B. Cement board, underlayment, and waterproofing membrane installed within the building interior: Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Inspect all surfaces upon which tile is to be applied for smoothness and cleanliness. Unsatisfactory variations (in excess of 1/4" in 8'-0" in thin set applications) shall be corrected before proceeding with the work of this Section. Surfaces shall be free of coatings, oil, wax and shall be roughened to permit scratch coat to bond. Ensure that all work by other trades is installed, imbedded and tested before proceeding with the work of this Section.

3.2 PREPARATION

- A. Protect surrounding work from damage or disfiguration.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Apply conditioner to substrate surfaces in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION

- A. Install adhesive, tile and grout in accordance with manufacturer's instructions and TCA Handbook.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align base and wall joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout. Form internal angles square and external angles bullnose.
- E. Sound tile after setting. Replace hollow sounding units.
- F. Allow tile to set for a minimum of 48 hours prior to grouting.
- G. Apply grout, strike and tool joints and cure in accordance with grout manufacturer's instructions. Damp cure as specified in TCA Detail requirements.
- H. Lay out tile work accurately, symmetrically and perpendicular and parallel to walls and floors in positions and locations indicated on the drawings. Lay tiles so that generally no tiles less than half sizes will occur. Fit tile closely around the work of other trades, slope floors uniformly to drains.
- I. Lay out tile work so that joints are centered over control/expansion joints in substrates and between dissimilar materials (ie. Joint between CMU and GB). Space tile accordingly, so that no tile will be cut between these joints. Provide expansion joints in tile in accordance with TCA detail EJ171 as indicated on the drawings and unless otherwise noted, at each expansion,

control, construction, or cold joint in the substrate beneath, at each column line, and/or at 16' on center in each dimension.

3.4 CLEANING

- A. Clean tile and grout surfaces, acid cleaners not permitted. Wash tile with clear water after the grout has stiffened. Clean with damp cloths and wet vac to remove all grout residue.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work with non-staining building paper.
- B. Do not permit traffic over finished floor surface for 4 days after installation.

- END OF SECTION 09 30 00 -

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system and perimeter trim as required to accommodate new work.
- B. Suspended acoustical ceiling panels.

1.2 RELATED WORK

- A. Sprinkler heads in ceiling system, Air diffusion devices in ceiling system, Light fixtures in ceiling system, and Fire alarm components in ceiling system.

1.3 REFERENCES

- A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM E1264 - Classification of Acoustical Ceiling Products.
- C. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

1.4 SYSTEM DESCRIPTION

- A. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Engage an experienced installer who has successfully completed acoustical installations similar in scope.
- B. Fire - Performance:
 - 1. Provide acoustical ceilings that conform with testing per ASTM E84, Flame spread: 25 or less. Smoke developed: 50 or less and ASTM E1264 for Class A products.
- C. Provide minimum 10-year non-sag warranty on all panels.
- D. Single - Source Responsibility: Obtain each type of acoustical ceiling and suspension system from a single source.
- E. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- F. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years' experience.

1.6 SUBMITTALS

- A. Submit under provisions of Division 1.

- B. Product Data: Provide data on metal grid system components and acoustical units.
- C. Samples: Submit two samples 6 x 6 inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 6 inches long, of each suspension system main runner, cross runner and edge trim.
- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Submit acoustical data: Noise Reduction Coefficient (NRC) and Ceiling Attenuation Class (CAC)
- G. Submit attic stock materials and closeout documentation per Division 1.
- H. Submittals Required for LEED Certification – comply with Section 01 81 13:
 - 1. Submit invoices and documentation showing manufacturing locations and origins of component materials for products that have been manufactured within a 100-mile radius of the project site. Where product is made up of multiple components, indicate the extraction, harvest, or recovery location of each component and the weight of each component. Include statement indicating material cost for each regionally manufactured product.
 - 2. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For acoustical ceiling panels and suspension systems, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 3. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.
 - b. For recycled content acoustical ceiling panels and steel suspension system: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include statement indicating material cost for each product having recycled content.
 - c. For manufacturers with extended producer responsibility programs: Documentation describing the program and confirmation that product is included in the program.
 - 4. MR Credit 4: BPDO – Material Ingredients
 - a. For acoustical ceiling panels and steel suspension system, if available: Material Ingredient Report.
 - 5. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied acoustical sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For acoustical ceiling panels: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or GREENGUARD Gold certification.
 - c. For composite wood ceiling panels: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM),

Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

6. EQ Prerequisite 3: Minimum Acoustic Performance

- a. For acoustic ceiling systems in all Core Learning Spaces: Documentation indicating the Noise Reduction Coefficient (NRC) demonstrating minimum 0.70 NRC.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C) and maximum humidity of 40 percent prior to, during and after acoustical unit installation.

1.8 SEQUENCING

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustical units after interior wet work is dry.

1.9 WARRANTY

- A. Provide under the provisions of Division 1.
- B. Acoustical Ceiling Tile: 2 years.
- C. Suspension System: 10 years.

1.10 MAINTENANCE

- A. Provide under the provisions of Division 1.
- B. Provide maintenance data including methods of cleaning.

PART 2 – PRODUCTS

2.1 MANUFACTURERS - SUSPENSION SYSTEM

- A. Armstrong World Industries, Prelude XL System (Used as Basis-of-Design)
- B. United States Gypsum Company
- C. Chicago Metallic
- D. Certainteed

2.2 SUSPENSION SYSTEM MATERIALS

- A. Non-fire Rated Grid: ASTM C635, intermediate duty, exposed T components die cut and interlocking.
- B. Grid Materials:
 - 1. For use with ACT-1, ACT-3 and ACT-5: Commercial quality cold rolled steel with galvanized coating.

2. For use with ACT-2: Aluminum.
 3. For use with ACT-4: Commercial quality cold rolled steel with galvanized coating, painted black
- C. Exposed Grid Surface Width: 15/16 inch.
- D. Grid Finish: Baked Polyester Paint, color to be White at all areas except Sensory 717, which is to receive a Tech Black finish.
- E. Accessories: Stabilizer bars, clips, splices, edge moldings, hold down clips and as required for suspended grid system.
- F. Support Channels and Hangers: Primed steel; size and type to suit application and ceiling system flatness requirement specified.
- G. ACT Cloud Trim: Armstrong Axiom Perimeter Trim, Extruded Aluminum with painted finish to match ceiling grid, 4" high profile.

2.3 MANUFACTURERS - ACOUSTICAL UNITS

- A. Armstrong World Industries (used as Basis-of-Design)
- B. United States Gypsum Company
- C. Chicago Metallic
- D. Certainteed

2.4 ACOUSTICAL UNIT MATERIALS

- A. ACT 1 – Basis-of-Design, Armstrong Fine Fissured High NRC, Square Lay-In, Item #1755.
 1. Size: 24 x 48 inches
 2. Thickness: 7/8 inches
 3. Composition: Wet-formed mineral fiber.
 4. NRC: 0.75
 5. CAC: 35
 6. Fire Hazard Classification: Class A, Flame Spread less than 25
 7. Edge: Square Lay-in
 8. Surface Color: White
 9. Surface Finish: Factory applied latex paint.
- B. ACT 2 – Basis-of-Design, Armstrong Ceramaguard Fine Fissured, Square Lay-In, Item #607.
 1. Size: 24 x 24 inches
 2. Thickness: 5/8 inches
 3. Composition: Wet-formed ceramic and mineral fiber composite.

4. NRC: 0.55
 5. CAC: 38
 6. Fire Hazard Classification: Class A, Flame Spread less than 25
 7. Edge: Square Lay-in
 8. Surface Color: White
 9. Surface Finish: Scrubbable factory applied paint finish.
- C. ACT 3 – Basis-of-Design, Armstrong Ultima Health Zone, Square Lay-In, Item #1935.
1. Size: 24 x 24 inches
 2. Thickness: 3/4 inches
 3. Composition: Wet-formed mineral fiber.
 4. NRC: 0.70
 5. CAC: 38
 6. Fire Hazard Classification: Class A, Flame Spread less than 25
 7. Edge: Square Lay-in
 8. Surface Color: White
 9. Surface Finish: Factory applied latex paint on DuraBrite acoustically transparent membrane.
- D. ACT 4 – Basis-of-Design, Armstrong Calla, Square Lay-In.
1. Size: 24 x 48 inches
 2. Thickness: 1 inch
 3. Composition: Wet-formed mineral fiber.
 4. NRC: 0.75
 5. CAC: 35
 6. Fire Hazard Classification: Class A, Flame Spread less than 25
 7. Edge: Square Lay-in
 8. Surface Color: Black
 9. Surface Finish: Factory applied latex paint
- E. ACT 5 – Basis-of-Design, Armstrong Formations, Squares/Rectangles Clouds
1. Ceiling Tile: Armstrong Calla, Square Lay-In.
 2. Size: 8'-0" x 12'-0" Clouds with 24" x 24" Tiles

3. Thickness: 7/8 inches
4. Composition: Wet-formed mineral fiber.
5. NRC: 0.75
6. CAC: 35
7. Fire Hazard Classification: Class A, Flame Spread less than 25
8. Edge: Square Lay-in
9. Surface Color: White, painted SW-6793 Bluebell.
10. Surface Finish: Factory applied latex paint

2.5 SPECIALTY CEILING MATERIAL

A. 9 Wood Inc., 2100 Series Panelized Linear; 2116-2

1. Size: 5 1/4 x 96 inches
2. Thickness: 3/4 inches
3. Composition: 95% recycled content.
4. NRC: 0.50
5. Fire Hazard Classification: Class A, Flame Spread less than 25
6. Texture: Smooth
7. Surface Color: White Oak
8. Relative Humidity (RH) of 25-55% and temperatures between 55-85° for installation

2.6 ACCESSORIES

- A. Touch-up Paint: Type and color to match acoustical and grid units.

2.7 LEED REQUIREMENTS

- A. Recycled Content: Provide acoustical ceiling panels with minimum 50 percent recycled content; provide steel with minimum 25 percent post-consumer recycled content.
- B. Acoustical sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- C. Acoustical ceiling panels: Comply with California Department of Public Health (CDPH) Standard Method v1.1-2010 or GREENGUARD Gold certification.
- D. Ceiling System Acoustical Performance in Core Learning Spaces: Minimum Noise Reduction Coefficient (NRC) of 0.70.
- E. Specialty ceilings to be FSC wood.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that layout of hangers will not interfere with other work. Confirm starting lines for layout with Architect.

3.2 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C-636 and manufacturer's instructions and as supplemented in this section.
- B. Intermediate - duty grid: Comply with ASTM C-636, suspension requirements of ASTM C-635, intermediate-duty systems, and manufacturer's installation instructions.
- C. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- D. Locate system on room axis according to reflected plan. Center grid in the room unless otherwise noted. For irregularly shaped rooms or rooms without an obvious centerline, verify grid layout with Architect.
- E. Install after major above ceiling work is complete and properly conditioned to prevent tiles from accumulating excessive moisture. Install hangers to metal deck or steel beams. Intermediate supports must be provided between main structural members for suspension of ceiling grid in all locations with non-composite metal deck. Coordinate layout and installation of acoustical ceiling units and suspension systems with other construction that penetrates ceiling. Coordinate the location of hangers with other work.
- F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- G. Nothing shall be suspended from ceiling suspension system. Independent hangers shall be provided for light fixtures, mechanical systems, etc.
- H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- I. Do not eccentrically load system or produce rotation of runners.
- J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
- K. Form expansion joints as detailed. Maintain visual closure.

3.3 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Install units after above ceiling work is complete.
- D. Install acoustical units level, in uniform plane, and free from twist, warp and dents.
- E. Cut panels to fit irregular grid and perimeter edge trim.

- F. Where bullnose concrete block corners occur, provide preformed closers to match edge molding.
- G. Install hold-down clips to retain panels tight to grid system within 20 ft of all exterior doors.

3.4 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 ATTIC STOCK MATERIALS

- A. At the end of the project, provide 2% of the acoustical tile and grid for each size, type, and pattern installed.

- END OF SECTION 09 51 00 -

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Rubber base.
- B. Transition strips.

1.2 RELATED SECTIONS

- A. Section 01 74 19 – Construction Waste Management and Disposal
- B. Section 01 81 13 – Sustainable Design Requirements
- C. Section 04 20 00 – Unit Masonry
- D. Section 09 29 00 – Gypsum Board
- E. Section 09 65 19 - Resilient Tile Flooring

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For resilient base, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content base: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include statement indicating material cost for each product having recycled content.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For resilient base adhesive, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For resilient base: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- D. Samples: Submit two sets of samples illustrating color for rubber base and reducing/trim strips for color selection by the Architect.

- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Closeout submittals: Manufacturer's warranty and maintenance data.
- G. Maintenance material submittals: Furnish extra materials per Division 1, 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. Rubber Base: Quantity equal to 2 percent of amount installed for each type indicated.
 - 2. Transition Strips: Quantity equal to 5 percent of amount installed for each type.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Johnsonite
- B. Roppe
- C. Mannington

2.2 MATERIALS

- A. Rubber Base: Standard Specification F-1861, Type TP, top set base coved (toe) style. Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
 - 1. Height: 4 inch
 - 2. Thickness: 1/8 inch
 - 3. Length: Roll
 - 4. Colors: To be selected from all of manufacturer's standard options.
- B. Base Accessories: Premolded end stops of same material, size and color as base.

2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by product manufacturer and complying with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED" and VOC limits set forth by the South Coast Air Quality Management District Rule #1168.
- C. Edge (transition) Strips: Flooring material manufactured by Johnsonite, Roppe, or Mannington, color to be the same as rubber base color adjacent to strip. Provide reducer and/or adapter strips for transitions between all dissimilar flooring finishes, including concrete, VCT, LVT, rubber, and hybrid resilient. All components must comply with ADAAG.
- D. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify concrete floors are dry to a maximum moisture content of 7 percent and exhibit negative alkalinity, carbonization or dusting.
- B. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.
- C. Verify that environmental conditions meet manufacturer's requirements.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

3.3 INSTALLATION - BASE

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.4 CLEANING

- A. Clean installed product per the manufacturer's recommendations.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Prohibit traffic on floor finish for 48 hours after installation.

- END OF SECTION 09 65 13 -

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient vinyl composition tile flooring.
- B. Resilient quartz tile flooring.

1.2 RELATED SECTIONS

- A. Section 01 23 00: Alternates
- B. Section 01 74 19: Construction Waste Management and Disposal
- C. Section 01 81 13: Sustainable Design Requirements
- D. Section 03 30 00: Concrete Floor finish.
- E. Section 09 65 13: Resilient Base and Accessories.

1.3 REFERENCES

- A. ASTM E84 - Surface Burning Characteristics of Building Materials.
- B. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- C. ASTM F1066 - Vinyl Composition Floor Tile.
- D. FS SS-W-40 - Wall Base: Rubber and Vinyl Plastic.
- E. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For resilient flooring, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content resilient flooring: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For resilient flooring and adhesive, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For resilient flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- D. Samples: Submit two sets of samples illustrating color and pattern for all tile for color selection by the Architect.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Submit MSDS for any applicable products used.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame/smoke rating requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

a. For quartz tile maintain a temperature of 68F – 80F for 3 days prior to, during and after completion of installation.

B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in performing work of this section and who is specialized in the installation of work similar to that required for this project.

1.8 MAINTENANCE DATA

A. Submit under provisions of applicable Division 1 sections.

B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Division 1.

B. Provide 2% of total tile per color/pattern used.

1.10 WARRANTY

A. Provide manufacturer's standard 5-year warranty on all tile flooring products.

B. Provide 2-year installer's warranty on installation. Warranty shall include material and labor for repair and replacement of any defective materials or installation issues.

PART 2 - PRODUCTS

2.1 MATERIALS – VINYL TILE FLOORING – BASE BID

A. Vinyl Composition Tile: ASTM F1066 and SS-T-312 BC, Type IV. Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.

1. Size: 12 x 12 inch
2. Thickness: 1/8 inch
3. Design: marbled
4. Manufacturers:
 - a. Armstrong, Style - Standard Excelon Imperial Textured (Basis-of-Design)
VCT – 8 – Premium Excelon Crown Textured
 - b. Tarkett, Azrock, Style - Custom Cortina
 - c. Mannington - Luxury
5. Colors: See Flooring Color Schedule on drawings for basis-of-design color selections. Nine colors of tile will be used.
6. Pattern: See drawings for patterns

2.2 MATERIALS – QUARTZ TILE FLOORING – PER ALTERNATE #7

A. Quartz Tile: ASTM F1066, Class 1 Rating per ASTM E648. Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.

1. Size: 12 x 12 inch
2. Thickness: 0.08 inch
3. Design: Tema (QTZ 3 – Mosaic)
4. Manufacturers:
 - a. Upofloor (Basis-of-Design)
 - b. Altro
 - c. Procedo, Versa Quartz
5. Colors: See Flooring Color Schedule on drawings for basis-of-design color selections. Nine colors of tile will be used.
6. Pattern: See drawings for patterns

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

1. Armstrong MC #808 liquid latex patch
2. Gibson Homans Co. #801 Redy Mastic
3. Ardex Latex Patch

B. Leveling (larger areas):

1. Ardex cement leveling
2. Planipatch by Mapei

C. Edge (transition) Strips: Flooring material manufactured by Mercer, Johnsonite, or equal, color to match vinyl base color adjacent to strip.

2.4 ADHESIVES (must be approved by Tile manufacturer)

A. Water resistant, Non-flammable, Low odor/odorless when dry, No asbestos content, Antimicrobial protection

B. Adhesives, primers, and sealers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED." Adhesives used in flooring installation shall meet testing and product requirements of California Department of Health Services Standard Practice for The Testing Of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

1. At minimum, products need to comply with VOC limits specified in LEED-for Schools, v4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify concrete floors are dry to a maximum moisture content of 7 percent and exhibit negative alkalinity, carbonization or dusting.
- B. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.
- C. Concrete surface to receive flooring shall be examined and properly prepared to ensure grains of sand and foreign materials have been removed. Surface shall be scraped and buffed with screen.
- C. Do not bridge building expansion joints with flooring.

3.2 PREPARATION – VINYL COMPOSITION TILE - BASE BID

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

3.3 PREPARATION – QUARTZ TILE – ALTERNATE #7

- A. Concrete slabs must conform to ACI 302.1R and ACI 302.2R.
- B. A vapor retarder of a minimum of 0.050 Perms or less must be placed directly under any on or below grade concrete slabs, consult ACI 302.2R and ASTM E-1745. This barrier must be fully intact and retain its integrity. The water to cement ratio of the concrete should not exceed 0.45.
- C. Perform moisture tests on concrete floors regardless of the age or grade level. Verify concrete substrate is dry in accordance with ASTM F 2170, in strict accordance with instructions.
- D. Perform moisture tests using three tests for the first 1,000 square feet and then a minimum of 1 test per each additional 1,000 sq ft. Moisture readings from concrete subfloors must not exceed 85% relative humidity per testing to ASTM F 2170. Test equipment must be properly calibrated per ASTM F 2170. If subfloor moisture exceeds the allowable maximum, contact the product manufacturer for instructions on how to proceed.
- E. Perform alkali tests to ensure pH levels of concrete subfloor surface do not exceed pH 9.9.
- F. Do not proceed with work until results of moisture condition and/or pH tests are acceptable.
- G. Meet and prepare concrete per ASTM F710 Standard for Concrete floors.
- H. Remove dust, old adhesive, paint, dirt, wax, sealer, crayon and all construction marking pen and paint markings, and all foreign matter from existing surfaces, remove ridges and bumps.

- I. Underlayment and Patching Compounds: Use only grey colored Portland cement based underlayments, moisture tolerant patching compounds must be used in potential wet areas; patching compounds are used for filling cracks, holes and leveling. White gypsum materials are not acceptable.
- J. Apply subfloor filler to low spots and cracks to achieve flatness to a tolerance of 3/16" over 10 feet (and/or per architect's specifications for slope and pitch), allow to cure. Never install flooring over gypsum-based toppings, underlayments, leveling or patching compounds, use only moisture tolerant patches in potential wet areas.

3.4 INSTALLATION – FLOORING

- A. Install in accordance with manufacturer's instructions. See drawings for patterns.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- F. Install tile to turn block pattern. Allow minimum 1/2 full size tile width at room or area perimeter.
- G. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- H. Install resilient edge strips at unprotected or exposed edges, and where flooring terminates.
- I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- J. Install feature strips and floor markings where indicated. Fit joints tightly.
- K. VCT installation should be rolled and protected.
- M. Corridor width to be 1/2 inch less than tile width module and base joint at floor to be raked back to receive tile floor and then grouted after tile is in place.
- O. Install resilient flooring in a manner consistent with Division 1 Indoor Air Quality Management requirements.

3.5 CLEANING

A. Vinyl Composition Tile – Base Bid only

- 1. Use only Johnson Technique Sealer (Base Coat), Ultra Glow finish, and Freedom, Bravo or Step-off strippers.
- 2. Stripping and Sealing:
 - a. Remove factory finish by removing all debris from floor with broom and dust mop. Use slow-speed floor machine with black stripping pad to strip the floor. After stripping the floor, rinse at least twice with clean water and let dry. (It is very helpful to use a wet/dry vacuum for picking up stripping solution and rinse water.) Apply Base Coat (one uniform

coat) with a clean prerinsed rayon mop head. Allow to dry 45 minutes. (Coverage for coat of Sealer (Base Coat) should be between 1,500 and 2,000 square feet per gallon.)

3. Apply Finish:

- a. After Sealer (Base Coat) has been allowed to dry properly (at least 45 minutes), apply first of 2 coats of UltraGlow. Apply UltraGlow in thin uniform coats and let dry for 1 hour between coats. Use clean prerinsed rayon mop head. (Coverage for UltraGlow should be between 2,000 and 2,500 square feet per gallon when used after Base Coat.) Keep everything off floor for as long as possible after applying the final coat of Showplace. Two to three hours would be considered minimum. A full 24 hours would give floor optimum drying time.

B. Quartz Tile – Alternate #7

1. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work. Entire floor to be protected with red rosin paper, taped.
- B. Prohibit traffic on floor finish for 48 hours after installation.

- END OF SECTION 09 65 19 -

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient athletic flooring.
- B. Accessories required for installation, maintenance and repair.

1.2 RELATED SECTIONS

- A. Section 01 74 19: Construction Waste Management and Disposal
- B. Section 01 81 13: Sustainable Design Requirements
- C. Section 03 30 00: Concrete Floor finish.
- D. Section 09 65 13: Resilient Base and Accessories.

1.3 REFERENCES

- A. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- B. ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).
- C. ASTM F386: Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces.
- D. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- E. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.
- F. ASTM F970: Standard Test Method for Static Load Limit.
- G. ASTM F1514: Standard Test method for Measuring Heat Stability of Resilient Flooring by Color Change.
- H. ASTM F1515: Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
- I. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- J. ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For resilient flooring, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content resilient flooring: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For resilient flooring and adhesive, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For resilient flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- D. Samples: Submit two sets of samples illustrating color and pattern for all tile for color selection by the Architect.
- E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Submit MSDS for any applicable products used.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame/smoke rating requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Products supplied must be protected from exposure to harmful weather conditions and must be safely stored on a clean, dry, flat surface. Store rolls of resilient athletic flooring upright.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. The Contractor shall be responsible for ensuring all site conditions meet the requirements of the Manufacturer, as referenced herein at sections 3.2 and 3.3.
- B. Concrete subfloors, on or below grade, must be installed over a permanent effective vapor retarder, respecting current versions of standard practice ASTM E1643 and standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010in).
- C. No concrete sealers or curing compounds are applied or mixed with the subfloors (refer to Section 03 05 00 – Common Work Results for Concrete of Division 3).
- D. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength). Refer to current version of ASTM F710.
- E. The subfloor surface must be free of any paint, wax, oil, grease, sealer, curing compound, solvent or any other contaminants that may inhibit bond. All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.
- F. Concrete to have smooth, dense finish, and be highly compacted with a tolerance of 1/8" in a 10ft radius (3.2mm in 3.05m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.
- G. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed 85%, in accordance with ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with ASTM F1869 (anhydrous calcium chloride).

- H. Maintain a stable room and subfloor temperature within the recommended range of 65°F to 86°F (18°C to 30°C), 48 hours prior to installation, during the installation, and 48 hours after the installation. Recommended ambient humidity control level is between 35 to 55%.
- I. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work. It is the General Contractor or Construction Manager's responsibility to maintain a secure and clean working area before, during and after the installation of the resilient athletic flooring.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced in performing work of this section and who is specialized in the installation of work similar to that required for this project.
- B. Manufactured product must have undergone a vulcanization process; factory lamination should not be accepted as equivalent.

1.8 MAINTENANCE DATA

- A. Submit under provisions of applicable Division 1 sections.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.9 EXTRA MATERIALS

- A. Furnish under provisions of Division 1.
- B. Provide 2% of total tile per color/pattern used.

1.10 WARRANTY

- A. Provide manufacturer's standard 5-year warranty on flooring products.
- B. Provide 2-year installer's warranty on installation. Warranty shall include material and labor for repair and replacement of any defective materials or installation issues.

PART 2 - PRODUCTS

2.1 MATERIALS – RESILIENT ATHLETIC FLOORING

- A. Basis of Design: Mondo Advance 8mm Vulcanized Roll
 - 1. Size: Sheets 6'-1" wide by 42'-7" long
 - 2. Thickness: 0.315" (8mm)
 - 3. Surface Texture: Smooth
 - 4. Colors: See Flooring Color Schedule on drawings for basis-of-design color selections. Nine colors of tile will be used.

2.2 ACCESSORIES

- A. Provide adhesive certified by Manufacturer: Mondo PU 105 (polyurethane). For suitability, recommendations and use please refer to Manufacturer's current printed adhesive guidelines. In some cases, Mondo EP 55 (epoxy) may be used in areas that have not been specified to receive Everlay, and that will not be subject to surface impacts (such as falling free weights) or heavier dynamic loads (such as bleachers).
- B. Patching or leveling compound to be supplied or recommended/approved by Manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure that concrete subfloors, on or below grade, are installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010in).
- B. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength). Refer to current version of ASTM F710.
- C. Ensure that no concrete sealers or curing compounds have been applied to or mixed into the concrete (refer to Section 03 05 00 – Common Work Results for Concrete of Division 3).
- D. Subfloor surface must be free of any paint, wax, oil, grease, sealer, curing compound, solvent or any other contaminants that may inhibit bond. All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.
- E. Confirm concrete has smooth, dense finish, and is highly compacted with a tolerance of 1/8" in a 10ft radius (3.2mm in 3.05m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.
- F. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed 85%, in accordance with ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not Advance Vulcanized (8mm) Technical Specification Sheet R062716 Page 7 of 8 exceed the tolerance of the adhesive specified, in accordance with ASTM F1869 (anhydrous calcium chloride).
- G. Maintain a stable room and subfloor temperature within the recommended range of 65oF to 86oF (18oC to 30oC), 48 hours prior to installation, during the installation, and 48 hours after the installation. Recommended ambient humidity control level is between 35 to 55%. I. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work. Ensure a secure and clean working area before, during and after the installation of the resilient athletic flooring.
- H. Do not bridge building expansion joints with flooring.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

3.4 INSTALLATION – FLOORING

- A. Install in accordance with manufacturer's instructions.
- B. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
- C. Install resilient edge strips at unprotected or exposed edges, and where flooring terminates.
- D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.5 CLEANING

- A. Always wait at least a minimum of 72 hours after the resilient athletic flooring has been completely installed before performing initial maintenance.
- B. For surfaces having received newly painted lines, wait a minimum of 30 days after the application of the paint before scrubbing the surface to ensure proper curing of the paint.
- C. Always maintain the resilient athletic flooring following Manufacturer's current printed guidelines.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work. Entire floor to be protected with red rosin paper, taped.
- B. Prohibit traffic on floor finish for 48 hours after installation.

- END OF SECTION 09 65 66 -

SECTION 09 66 23
RESINOUS MATRIX TERRAZZO

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Epoxy matrix terrazzo floor.
- B. Divider strips

1.2 RELATED SECTIONS

- A. Section 01 23 00 – Alternates
- B. Section 01 74 19 – Construction Waste Management and Disposal.
- C. Section 01 81 13 – Sustainable Design Requirements.
- D. Section 03 30 00 – Cast-in-place Concrete: Concrete subfloor with broom finish.
- E. Section 07 92 00 – Joint Sealers: Joint between terrazzo base and wall surface.
- F. Section 09 30 00 – Tiling: Porcelain Tile Base

1.3 REFERENCES

- A. ASTM C150 - Portland Cement.
- B. NTMA (National Terrazzo and Mosaic Association, Inc.) - Terrazzo Ideas and Design Guide.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied primers and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For interior resinous flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010.
- C.. Shop Drawings: Indicate divider strip and control joint layout and details of adjacent components. Provide drawings of all precast terrazzo work.
- D.. Product Data: Provide data for divider strips, control joint strips, sealer and terrazzo.
- E. Samples: Submit two samples, 6 x 6 inch in size illustrating color, chip size and variation, chip gradation, matrix color and ground top surface of divider strip.

1.5 MAINTENANCE DATA

- A. Submit cleaning and maintenance data.

B. Include procedures for stain removal, stripping, and sealing.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NTMA.

1.7 QUALIFICATIONS

A. Applicator/Installer: Company specializing in performing the work of this section with minimum 5 years experience, and shall be approved by the manufacturer of the system. Experience in the last five years shall include three projects of comparable scope and complexity of at least 75% of the square footage of this project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site to protect from damage.

B. Store resin materials in a dry, secure area.

C. Maintain minimum temperature of 60 degrees F.

D. Keep products away from fire or open flame.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees.

B. Maintain this temperature range 24 hours before, during, and 72 hours after installation of flooring.

1.10 PRE-INSTALLATION CONFERENCE

A. Pre-installation conference shall be held on the job-site with Owners' Representative, Manufacturer's Representative, Flooring Subcontractor, and Architect to review slab conditions, details at all conditions, and site conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General Polymers Corp.

B. Flowcrete Americas

C. Terrazzco

2.2 MATERIALS

A. Epoxy Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.

B. Portland Cement: ASTM C150, Type 1; white color; modified to NTMA higher compressive strength requirements.

- C. Surface Aggregate: Crushed marble size in accordance with NTMA chip size for standard gradation, uniform coloration.
- D. Interior resinous flooring: Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010.

2.3 ACCESSORIES

- A. Divider Strips: 3/8 inch thick zinc alloy exposed top strip and zinc coated steel concealed bottom strip.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strip, zinc coated steel concealed bottom strip, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring device as required.
- C. Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Cleaner: Neutralizing liquid type, pH of 7.
- E. Epoxy grout: As per Manufacturer's standard.
- F. Sealer: Colorless, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components. Interior wet-applied adhesives, paints, primers, sealers, and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.4 PROPORTIONING

- A. Topping: Three parts aggregate chip; one part aggregate dust; one part matrix binder and hardener.

2.5 FLOOR COLORS

- A. Matrix: color as selected.
- B. Surface Aggregate: NTMA color.

2.6 BASE AND CURB COLORS

- A. Matrix: color as selected.
- B. Surface Aggregate: NTMA color.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Do not begin terrazzo work until concrete substrate has cured 28 days minimum.

3.2 PREPARATION

- A. Clean substrate of foreign matter, by using vacuum blasting technique.

- B. Apply primer to manufacturer's instructions.
- C. Treat any non-moving cracks with flexible epoxy membrane, and sand prior to applying primer.
- D. Treat any moving cracks by filling with epoxy membrane, and an applied coat of membrane from strip to strip, to isolate crack in concrete.
- E. Contractor to include the treatment of moving cracks totaling five percent of the total footage of epoxy terrazzo, with unit cost to deduct or add to the five percent base quantity.

3.3 INSTALLATION - ACCESSORIES

- A. Saw cut substrate to install divider and control joint strips
- B. Install divider and control joint strips straight and level to locations indicated.
- C. Install base and curb divider and control joint strips to match floor pattern. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 APPLICATION - TERRAZZO

- A. Place terrazzo mix over prepared substrate to a minimum thickness of 1/4 inch.

3.5 APPLICATION - BASE

- A. Flush Vertical Base: 3/8 inch minimum topping bonded to wall.

3.6 CURING

- A. Cure terrazzo topping by sheet polyethylene curing method.
- B. Close area to allow undisturbed curing.

3.7 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Produce terrazzo finish surface to match approved sample, with 70 percent chip exposed.
- C. Grind terrazzo surfaces with power disc machine; sequence with coarse abrasive prior to grouting, to fine grit abrasive after grouting, using a wet method.
- D. Apply grout to match mortar over ground surface to fill honeycomb exposed during grinding.
- E. Remove patch coat by grinding, using a fine grit abrasive.
- F. Hand grind base and cove similarly.

3.8 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.8 CLEANING

- A. Scrub and clean terrazzo surfaces with cleaner in accordance with manufacturer's instructions. Let dry.
- B. Immediately when dry, apply sealer in accordance with manufacturer's instructions. Let dry.
- C. Seal and polish surfaces, in accordance with manufacturer's instructions.

3.9 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over finished terrazzo surfaces.

- END OF SECTION 09 66 23 -

SECTION 09 67 23.01
EPOXY RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes one resinous flooring systems, with epoxy body.
 - 1. Application Method – Epoxy Body: Flat metal or plastic blade, power or hand troweled.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied primers and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For interior resinous flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010.
- C. Samples for Verification: For each resinous flooring system required, 5 inches (150 mm) square, applied to a rigid backing.
- D. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- F. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. Epoxy resin mortar-based flooring system, 12% post-consumer glass with urethane sealers). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

- B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
 - 2. Contractor shall have completed at least 10 projects of similar size and complexity.
- C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
 - 1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
- E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
 - a. Include 48-inch (1200-mm) length of integral cove base.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference:
 - 1. Construction Manager shall arrange a meeting not less than thirty days prior to starting work.
 - 2. Attendance:
 - a. Construction Manager.
 - b. Resinous Flooring Contractor.
 - c. Architect/Owner's Representative.
 - d. Manufacturer/Installer's Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.

- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
 - 1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- D. Concrete substrate shall be properly cured. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.7 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of two full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of two full years from date of installation.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include,
 - 1. Broadcast systems will not be accepted. Trowel mortar only.
- B. Acceptable Manufacturers,
 - 1. Stonhard - Basis of design.
 - 2. Dex-o-tex
 - 3. Sika
- C. Product: Subject to compliance with requirements:
 - 1. Stonhard Inc.; Stonblend GSI®

2.2 Stonblend GSI®

- A. System Characteristics:

1. Color and Pattern: TBD
 2. Wearing Surface: smooth Matte finish.
 3. Integral Cove Base: 4" high
 4. Overall System Thickness: 3/16 inch (5 mm).
- B. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Primer:
 - a. Material Basis: Stonblend Primer
 - b. Resin: Epoxy.
 - c. Formulation Description: 2 component, high solids.
 - d. Type: non pigmented.
 - e. Finish: standard.
 - f. Number of Coats: one.
 2. Mortar Base:
 - a. Material Basis: Stonblend Mortar
 - b. Resin: Epoxy.
 - c. Formulation Description: 3 component, high solids.
 - d. Application Method: Screed, steel finishing trowel.
 - 1) Thickness of Coats: 3/16 inch (5 mm).
 - 2) Number of Coats: One.
 - e. Aggregates: Pigmented quartz blended aggregate.
 3. Grout Coat:
 - a. Material Basis: Stonblend Grout Coating
 - b. Resin: Epoxy.
 - c. Formulation Description: 2 component, high solids.
 - d. Type: Clear.
 - e. Finish: standard.
 - f. Number of Coats: two, applied wet on wet.
 4. Sealer:
 - a. Material Basis: Stonshield Sealer.
 - b. Resin: Epoxy
 - c. Formulation Description: 2 component, high solids.
 - d. Type: Clear.
 - e. Finish: Matte
 - f. Number of Coats: one.
 5. Topcoat:
 - a. Material Basis: Stonseal CF7.
 - b. Resin: VOC EPA Compliant, Waterborne, Aliphatic Polyurethane.
 - c. Formulation Description: 2 component 100% high solids.
 - d. Type: Clear.
 - e. Finish: Matte.
 - f. Texture: 100 grit aluminum oxide
 - g. Number of Coats: Two
 6. Integral Cove Base

- a. Material Basis: Stonclad GS
 - b. Total Thickness: 1/8 inch.
 - c. Total Height, wall: 4", as shown on drawings.
 - d. Total Length, floor: 3 inches
 - e. Top Edge: 1/8 inch metal top strip by Resinous Flooring manufacturer.
 - f. Sealant: See Division 7 "Joint Sealants" for paintable caulk sealant by others.
 - g. Base Sealant: Continuous with floor sealant.
- C. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
- 1. Compressive Strength: 6,000 psi after 7 days per ASTM C 579.
 - 2. Tensile Strength: 1,500 psi per ASTM C 307.
 - 3. Flexural Strength: 2,200 psi per ASTM C 580.
 - 4. Water Absorption: < 1% per ASTM C 413.
 - 5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
 - 6. Flammability: Class 1 per ASTM E-648.
 - 7. Hardness: 85 to 90, Shore D per ASTM D 2240.

2.3 Stonclad GS®

- A. System Characteristics:
- 1. Color and Pattern: Charcoal
 - 2. Wearing Surface: Standard smooth.
 - 3. Integral Cove Base: 4", see drawings
 - 4. Overall System Thickness: nominal 1/4"
- B. System Components: Manufacturer's standard components that are compatible with each other and as follows:
- 1. Primer:
 - a. Material Basis: Stonhard Standard Primer
 - b. Resin: Epoxy
 - c. Formulation Description: (2) two component, 100 percent solids.
 - d. Application Method: Squeegee and roller.
 - e. Number of Coats: (1) one.
 - 2. Mortar Base:
 - a. Material design basis: Stonclad GS
 - b. Resin: Epoxy.
 - c. Formulation Description: (3) three component, 100 percent solids.
 - d. Application Method: Metal Trowel.
 - 1) Thickness of Coats: nominal 1/4 inch (6.4 mm).
 - 2) Number of Coats: One.
 - e. Aggregates: Pigmented Blended aggregate.
 - 3. Top Coat:
 - a. Material Basis: Stonseal CF7.
 - b. Resin: VOC EPA Compliant, Waterborne, Aliphatic Polyurethane.
 - c. Formulation Description: 2 component 100% high solids.
 - d. Type: Clear.
 - e. Finish: Matte.
 - f. Texture: 100 grit aluminum oxide
 - g. Number of Coats: Two
- C. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
- 1. Compressive Strength: 10,000 psi after 7 days per ASTM C 579.
 - 2. Tensile Strength: 1,750 psi per ASTM C 307.

3. Flexural Strength: 4,000 psi per ASTM C 580.
4. Water Absorption: < 1% per ASTM C 413.
5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
6. Flammability: Class 1 per ASTM E-648.
7. Hardness: .85 to .90, Shore D per ASTM D 2240.
8. Flexural Modulus of Elasticity: 2.0×10^6 psi per ASTM C-580
9. Thermal Coefficient of Linear Expansion: 1.4×10^{-5} in./in. °F per ASTM C-531

2.4 ACCESSORY MATERIALS

- A. Primer: Type recommended by manufacturer for substrate and body coats indicated. Formulation Description: Stonhard Stonblend Primer, 100% solids.
- B. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coats indicated. Formulation Description Only if application above grade Stonproof ME7.
- C. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- D. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 1. Mechanically prepare substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup or Diamond Grind with a dust free system.
 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 3. Verify that concrete substrates meet the following requirements.
 - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
 - b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 6 lb of water/1000 sq. ft. of slab in 24 hours.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Stonblend GSI mortar, apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: TBD inches high.
- D. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using steel finishing trowels or power trowel material using manufacturer's specially designed power trowel blades.
- E. Groutcoat: Remove excess unbonded granules by lightly abrading or scraping and vacuuming the floor surface. Mix and apply grout coat with strict adherence to manufacturer's installation procedures and coverage rates.
- F. Sealer: Lightly sand or scrape surface to remove any floor surface irregularities. Mix and apply sealer with strict adherence to manufacturer's installation procedures.
- G. Matte Finish: Lightly sand or scrape surface to remove any floor surface irregularities. Mix and roller apply mar resistant finish with strict adherence to manufacturer's installation procedures.

3.3 TERMINATIONS

- A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

- D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. Construction Manager is responsible for protection.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. Construction Manager is responsible for cleaning prior to inspection.

- END OF SECTION 09 67 23.01 -

SECTION 09 67 23.02
URETHANE RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes one resinous flooring system, one with urethane body.
 - 1. Application Method: Metal, power or hand troweled.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied primers and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For interior resinous flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010.
- C. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.
- D. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- F. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. Urethane mortar-based system with decorative quartz topping). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

- B. **Installer Qualifications:** Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
 2. Contractor shall have completed at least 10 projects of similar size and complexity.
- C. **Source Limitations:** Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- D. **Manufacturer Field Technical Service Representatives:** Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
- E. **Mockups:** Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
 - a. Include 48-inch (1200-mm) length of integral cove base.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 3. Sign off from Architect and Owner/Owners agent on texture for slip resistance must be complete before installation of flooring system.
- F. **Pre-installation Conference:**
1. Construction Manager shall arrange a meeting not less than thirty days prior to starting work.
 2. Attendance:
 - a. Construction Manager.
 - b. Resinous Flooring Contractor.
 - c. Architect/Owner's Representative.
 - d. Manufacturer/Installer's Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.7 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of two full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of two full years from date of installation.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

- A. Available Products: Subject to compliance with requirements, product that may be incorporated into the work include,
 - 1. Unsealed or "self-sealing" urethane mortar systems, multiple layers of liquids and broadcasts will not be accepted, and will result in a disqualification from bid.
- B. Acceptable Manufacturers,
 - 1. Stonhard - Basis of design.
 - 2. Dex-o-Text
 - 3. Sika

- C. Products: Subject to compliance with requirements:
1. Stonhard, Inc.; Stonclad UT®, With topcoat Stonkote HT4
- D. System Characteristics:
1. Color and Pattern: TBD
 2. Wearing Surface: Light texture
 3. Integral Cove Base: TBD
 4. Overall System Thickness: nominal 1/4".
 5. Interior resinous flooring: Comply with California Department of Public Health (CDPH) Standard Method v1.1–2010.
- E. System Components: Manufacturer's standard components that are compatible with each other. Interior wet-applied adhesives, paints, primers, sealers, and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED." Components shall be as follows:
1. Mortar Base:
 - a. Material design basis: Stonclad UT
 - b. Resin: Urethane.
 - c. Formulation Description: (4) four-component, 100 percent solids.
 - d. Application Method: Screed, Trowel.
 - 1) Thickness of Coats: 1/4".
 - 2) Number of Coats: One.
 - e. Aggregates: Pigmented Blended aggregate.
 2. Topcoat:
 - a. Material Basis: Stonkote HT4
 - b. Resin: Epoxy.
 - c. Formulation Description: (2) two-component, 100% solids.
 - d. Type: Pigmented
 - e. Finish: Standard.
 - f. Number of Coats: one.
 3. Integral Cove Base
 - a. Material Basis: Stonclad GS
 - b. Total Thickness: 1/8 inch.
 - c. Total Height, wall: 4" or 6", as shown on drawings.
 - d. Total Length, floor: 3 inches
 - e. Top Edge: 1/8 inch metal top strip by Resinous Flooring manufacturer.
 - f. Sealant: See Division 7 "Joint Sealants" for paintable caulk sealant by others.
 - g. Base Sealant: Continuous with floor sealant.

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

- F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 7,700 psi after 7 days per ASTM C 579.
2. Tensile Strength: 1,000 psi per ASTM C 307.
3. Flexural Strength: 2,400 psi per ASTM C 580.
4. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
5. Flammability: Class 1 per ASTM E-648.
6. Hardness: 80 to 84, Shore D per ASTM D 2240.
7. Flexural Modulus of Elasticity: 2.6×10^6 psi per ASTM C-580
8. Thermal Coefficient of Linear Expansion: 1.1×10^{-5} in./in.°F per ASTM C-531.
9. Abrasion Resistance: 0.03` gm max. weight loss per ASTM D-4060, CS-17.

2.2 ACCESSORY MATERIALS

- A. Primer: Type recommended by manufacturer for substrate and body coats indicated. Formulation Description: Stonclad UT urethane mortar is self priming.
- B. Pitching and Leveling: Use a four component fast setting Urethane grout. Moisture resistant polyurethane based grout designed for permanent repairs under flooring system. Stonhard, Stonset TG 6. See drawings 1/4" per foot slope to drains. Use standard drain detail, saw cut and chase.
- C. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coats indicated. Formulation Description Only if application above grade Stonproof ME7. Must include texture 3 to ensure intercoat adhesion.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 1. Mechanically prepare substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 3. Verify that concrete substrates are dry.
 - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
 - b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 7 lb of water/1000 sq. ft. of slab in 24 hours.

- c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- 4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material, and CT5 concrete crack treatment.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Stonshield cove mortar, apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, of cove base. Round internal and external corners.
 - 1. Integral Cove Base: 4" inches high.
- D. Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate at manufacturer's recommended height using specially designed trowel and or Screed box.
- E. Broadcast: Immediately broadcast quartz silica aggregate into the wet mortar using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- F. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

- G. Broadcast: Immediately broadcast quartz silica aggregate into the undercoat using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- H. Apply topcoat in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS

- A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal the flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. Construction Manager is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

- END OF SECTION 09 67 23.02 -

SECTION 09 67 66
FLUID-APPLIED ATHLETIC FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope

1. The complete installation of polyurethane surfacing over high-performance resilient base mat, including adhesives, resilient base mat, polyurethane sealer, polyurethane structure layer, surface topcoat, and court markings.

B. Related work specified under other sections.

1. Section 03 30 00 – Cast-in-Place Concrete - Concrete and Concrete Finishing
 - a. Concrete Slab Depression: a total of 9 mm, equal to system thickness, (0.3543 inches).
 - b. Surface Finish: steel troweled and finished smooth.
 - c. Concrete Tolerance: 1/8" (3mm) in radius of 10' (3m). Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
 - d. **NO CURING AGENTS OR SEALERS ARE TO BE APPLIED TO THE CONCRETE SLAB.**
2. Section 07 13 26 - Membrane Waterproofing and Dampproofing
 - a. Concrete subfloors on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on the earth side of below grade walls by Construction Manager using suitable type membrane.
 - b. Sand-Poly-Sand slab construction **is not** an acceptable construction.
3. Section 08 71 00 – Door Hardware - Thresholds
4. Section 11 66 23 – Gymnasium Equipment - Game Standard Inserts

1.02 QUALITY ASSURANCE

A. Floor System Supplier Qualifications

1. Supplier shall be an established firm experienced in field and have been in business for a minimum of ten (10) years; Robbins, Inc. or an approved equal.
2. Formulator shall be ISO-9001 certified for quality control, and ISO-14001 certified for environmental care, and provide copy of Certification document upon request.

B. Floor Contractor/Installer Qualifications and Certifications

1. Floor Contracting Company and field personnel shall be trained by supplier on proper installation and finishing process.

C. System Industry Approvals

1. Floor system shall be approved by F.I.B.A. (International Basketball Federation), and provide copy of Approval upon request.
2. Floor system shall be approved by I.H.F. (International Handball Federation), and provide copy of Approval upon request.

D. System Technical Data:

Technical Data			
Character	Point-elastic		
Classification	n/a		
Nominal thickness	9 mm	(0.3543 inches)	
Shock Absorption	20%		EN 14808
Shock Absorption	(29%)		(DIN 18032-91)
Vertical Deformation	1.0 mm		EN 14809
Linear Friction (dry)	98		EN 13036-4
Linear Friction (damp)	0.3		Leroux
Ball Bounce	98 %		EN 12235
Gloss	3%		EN 2813
Resistance to rolling load	≥1500 N		EN 1569
Resistance to impact	≥800 gr @ 10°C		EN 1517
	≥1200 gr @ 17°C		EN 1517
Resistance to indentation	0.35 mm @ 5 min		EN 1516
	0.15 mm @ 24 hrs		EN 1516
Resistance to wear	150 mg		EN ISO 2813
Flammability	Bfl-S1		EN 13501-1
V.O.C. content - Adhesive	Solvent free		
V.O.C. content - Topcoat	0.01 gr/lit (EU)		2004/42/EG
	45 gr/lit (US)		ASTM D 3960
Adhesive composition	Free of solvents and heavy metals		
Resin composition	Free of solvents and heavy metals		
Elongation at break - Structure	150%		DIN 53455
Tensile Strength - Structure	8 N/mm2	(1,160 psi)	DIN 53455
Tear Strength - Structure	25 N/mm	(142 pli)	DIN 53455
Colour fastness	8 (excellent)		DIN 54004

1.03 SUBMITTALS

A. Manufacturer's Product Data

1. Submit Floor System specification sheets.

B. LEED Submittals: Comply with Section 01 81 13.

1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

C. Concrete Guidelines

1. Submit three (3) copies of recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive to receive granulated base mat and polyurethane floor system.

D. Samples

1. Submit one (1) sample of flooring system
2. Submit one (1) Topcoat Standard Color Chart
3. Submit one (1) Linepaint Color Chart

E. Maintenance Literature

1. Submit copy of manufacturer's Maintenance Instructions.

F. References

1. Submit Letter attesting that Floor Contractor and Field Personnel have been properly trained to perform work per specifications and contract.
2. Reference list of three individual for whom installer has worked on projects of similar size and magnitude.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials

1. Material shall not be delivered or installed until all masonry and painting work are completed and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature shall be at least 55 degrees Fahrenheit, and ambient relative humidity shall be 75% or less. In-slab relative humidity shall be 85% or less.
2. Area where materials are to be stored should be maintained at least 55 degrees Fahrenheit and under 75% relative humidity by the Construction Manager.

1.05 JOB CONDITIONS-SEQUENCE

- A. Do not install floor system until concrete has been cured 60 days and the requirements in paragraph 1.01 and 1.04 are obtained.
- B. Construction Manager is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.
- C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Environmental temperatures must average a minimum of 65 degrees Fahrenheit for one full week proceeding, throughout, and 72 hours following application.
- D. After floors are finished, area to be kept locked by Construction Manager to allow curing time for the paint and finish system(s). No other trades are to be allowed on floor until it is accepted in writing by owner or owner's authorized agent.

1.06 GUARANTEE

- A. Manufacturer shall warranty the flooring material to be free from manufacturing defects for a period of 25 years.

Part 2-PRODUCTS

2.01 MATERIALS

NOTE: USE OF ANY NON-APPROVED COMPONENT SUBSTITUTIONS SHALL VOID WARRANTY.

A. Basis-of-Design System - Robbins PULASTIC Classic 90 System

1. Adhesive
 - a. Pulastic Tacly Adhesive: a two-component polyurethane adhesive
2. Shock Pad
 - a. Shock Pad, a granulated rubber/polyurethane mat 7.0 mm thick.

3. Pad Sealer
 - a. Pulastic EG Sealer: a two-component polyurethane sealer
4. Polyurethane Resin
 - a. Pulastic GM1500 Compound: a pigmented two-component polyurethane resin
5. Coating
 - a. Pulastic Coating 221W: a pigmented, two-component, water-dispersed polyurethane surface coating.
 - 1) Color Options: **Topcoat color to be selected from the following standard colors:**
 - a) 401 Lime Green
 - b) 417 May Green
 - c) 400 Green Oxide
 - d) 407 Turquoise Mint
 - e) 205 Sand Beige
 - f) 800 Yellow Ochre
 - g) 106 Autumn Brown
 - h) 100 Red Oxide
 - i) 307 Pastel Blue
 - j) 308 Pigeon Blue
 - k) 306 Steel Blue
 - l) 305 Sky Blue
 - m) 309 Capri Blue
 - n) 504 Stone Grey
 - o) 506 Dusty Grey
 - p) 507 Iron Grey
6. Game line Paint
 - a. Pulastic Linepaint: a pigmented, two-component polyurethane paint.
 - 1) Color Options: **Court Marking colors to be selected from the following standard colors:**
 - a) Black
 - b) Light Grey (504)
 - c) White
 - d) Light Blue
 - e) Signal Blue
 - f) Dark Blue
 - g) Lilac
 - h) Ruby Red
 - i) Red Orange
 - j) Pastel Orange
 - k) Yellow
 - l) Light Green (401)
 - m) Dark Green (400)
 - n) Dark Brown (106)
 - o) Light Brown
 - b. Option: Pulastic Linepaint-W: a pigmented, two-component, water-dispersed polyurethane paint.
- B. Alternative Manufacturers - Equivalent System from:
 1. Connor Sports
 2. Tarkett Sports

Part 3-EXECUTION

3.01 INSPECTION

- A. Inspect concrete slab for proper levelness tolerance, dryness, and possible contamination, (see Part 1 –Sec 1.01 and Sec. 1.04) and report any discrepancies to the Construction Manager and architect in writing.

- B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the Construction Manager.
- C. Subfloor shall be broom cleaned by Construction Manager.
- D. Construction Manager will notify the flooring installation company to proceed with the installation after concrete slab specifications are met.
- E. Installer shall perform tests for moisture and adhesion prior to application and report adverse conditions to the Construction Manager in writing.
- F. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

3.02 INSTALLATION

A. Robbins Pulastic

- 1. Shock Pad
 - a. Mix two-component Tacky Adhesive according to supplier's instructions and spread adhesive using ROBBINS PULASTIC notched trowel.
 - b. Unroll polyurethane/rubber granulated base mat into freshly applied adhesive. Seams shall be in virtual contact with absence of compression fit. Roll surface of base mat with a medium-size roller.
- 2. Sealer
 - a. Mix two-component EG Sealer according to supplier's instructions and spread sealer over base mat using a straight trowel. Allow to cure minimum 12 hours before proceeding.
- 3. Structure Layer
 - a. Mix two-component ROBBINS PULASTIC GM1500 pigmented polyurethane resin and spread over EG Sealer according to supplier's instructions. Allow to cure minimum 12 hours before proceeding.
 - b. Mix two-component ROBBINS PULASTIC GM1500 pigmented polyurethane resin and apply at proper thickness according to supplier's instructions. Allow to cure minimum 12 hours before proceeding.
- 4. TopCoat
 - a. Mix two-component ROBBINS PULASTIC Coating 221W and apply using ROBBINS PULASTIC lambswool roller(s) according to suppliers instructions. Allow 24 to 48 hours curing time before proceeding.
- 5. Gamelines
 - a. Mix two-component ROBBINS PULASTIC PU-Linepaint according to supplier's instructions.
 - b. Line painting should be in accordance with supplier's directions.
 - c. Color of court markings shall be chosen from ROBBINS PULASTIC PU-Linepaint standard colors.
 - d. Consult architectural drawings for game line locations and chosen colors.

B. Perimeter Molding (Optional):

- 1. Install a rubber base, anchored to the walls with standard base cement.

3.03 CLEANING

- 1. Clean up all unused materials and debris and remove from the premises. Dispose of empty containers in accordance with federal and local regulations.

3.04 PROTECTION

1. Cure Time
 - a. No traffic or other trades shall be allowed on the surface for a period of one week following completion to allow for complete and proper cure of the finish.
2. Other Trades
 - a. It shall be the responsibility of the flooring contractor to protect the surface from damage by other trades before acceptance by the owner or the owner's authorized agent.
3. Safety
 - a. No smoking, open flames or sparks from electrical equipment or any other source shall be permitted during the installation process, or in areas where materials are stored

- END OF SECTION 09 67 66 -

SECTION 09 72 00
WALL COVERINGS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

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

1.1 SUMMARY

This Section includes the following:

- 1. Vinyl Wall Covering with custom printed digital images in Corridor 011 and Corridor 021.
- 2. Vinyl Wall Covering with custom printed digital images in Alternate Corridor 004, Corridor 019,

- A. Related Sections: The following sections contain requirements that relate to this Section:

- 1. Division 01 Section "Alternates".

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

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

- 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.

- B. LEED Submittals: Comply with Section 018113.

- 1. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied adhesives and primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1 – 2010 and VOC content in g/L. Include volume of material applied per product.
- b. For wallcoverings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v.1.1 – 2010.

- C. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.

- D. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.

- 1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat.

- E. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.
 - 1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat.
- F. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.
 - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141 for appearance shading characteristics.
 - 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.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Product shall be packaged with care to prevent flat spots, creases, or splices. Do not deliver wall coverings to Project site until areas are ready for installation.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.
- C. Before installing wall covering, permit them to reach room temperature.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less Class A.
 - b. Smoke-Developed Index: 50 or less.
 - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 286.

2.2 VINYL WALL COVERING VWC-#

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Eykon Design Resources (Basis of Design)
 - 2. Koroseal Interior Products Group.
 - 3. Wolf Gordon.
 - B. Description: Provide mildew-resistant products in rolls from same production run and complying with the following:
 - 1. CFFA-W-101-D for Type II, Medium-Duty products.
 - 2. ASTM G 21
 - 3. ASTM F 793 for peelable strippable wall coverings.
 - a. Category: V, Type II, Commercial Serviceability
 - C. Total Weight: 20 oz, excluding coatings.
 - D. Width: 54 inches (1372 mm) per panel, total size 15 feet wide by 8 feet high.
 - E. Backing: Nonwoven fabric.
 - F. Graphics: To be supplied by Architect via vector file during submittal review process. Each location will receive a different graphic.
 - G. Locations: Two locations per base bid – one in Corridor 011 and one in Corridor 021. Two locations (VWC-1 and VWC-2) per Alternate #2 in Corridor 004. One location per Alternate #4 in Corridor 019.
- ### 2.3 CLEAR PROTECTIVE THERMOPLASTIC COVERING SHEETS
- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Norva Plastics - Kydex

- B. Description: Acrylic/PVC alloy extruded into smooth flat sheets. ASTM E-84 Class A.
- C. Size: 4'x8'x1/8" sheets, attach to wall to fully cover digital printing wallcovering panels.

2.4 ACCESSORIES

- A. Adhesive: Mildew-resistant, non-staining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
- B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 90 00 "Painting and Coating" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.
- C. Seam Tape: As recommended in writing by wall-covering manufacturer.
- D. Interior wet-applied adhesive and primer/sealer: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements – LEED."

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - a. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - b. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - c. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- C. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- D. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches (150 mm) from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.
- F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

- END OF SECTION 09 72 00 -

SECTION 09 84 33
MODULAR METAL SOUND-ABSORBING WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Perforated and un-perforated metal wall panels at Commons 002.
2. Acoustical backing.
3. Suspension assemblies
4. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, trims, and other devices required for a complete installation.
5. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support metal wall suspension system.
6. Coordinate layout and installation of items penetrating or being installed into wall systems with responsible trades.

B. Related Sections:

1. Section 05 40 00 – Cold-Formed Metal Framing
2. Section 09 22 16 – Non-Structural Metal Framing
3. Section 09 29 00 – Gypsum Board Assemblies

1.3 DEFINITIONS

- A. LR: Light Reflectance coefficient.
- B. NRC: Noise Reduction Coefficient.
- C. CAC: Ceiling Attenuation Class.
- D. STC: Sound Transmission Class.

1.4 SUBMITTALS

- A. Product Data: Manufacturers product data for each type of product specified in this section.

- B. Product Certification: Manufacturer's certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.
- C. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content panels: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For wall panels: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1 – 2010.
- D. Shop (Coordination) Drawings: Submit shop drawings for wall elevations, drawn to scale, and coordinating penetrations and wall mounted items. Show the following details:
 - 1. Wall elevation plan layout including joint patterns & details.
 - 2. Metal ceiling and wall suspension system plan with appropriate components, suggested support locations& details.
 - 3. Method of attaching suspension system to building structure.
 - 4. Coordination with: light fixtures, air outlets and inlets, speakers, railings, and other interfaces.
 - 5. Special moldings at ceilings, rail attachments, and other junctures with adjoining construction.
 - 6. Framing and support details for work supported by wall suspension system.
 - 7. List of materials, dimensions, mount locations and any special details.
 - 8. Minimum drawing scale: 1/8" = 1'-0".
 - 9. Provide full scale drawings of perforation patterns. Provide minimum 1"=1'-0" scale layout for each panel type showing perforation layout and orientation as required.
- E. Samples for Verification: Full-size units (or as specified below) of each type of wall assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.
 - 1. 12-inch square, (acoustical) metal pan units.
 - 2. 12-inch long samples of each exposed molding or trim.
 - 3. 12-inch long samples of each suspension component.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" (Section 1.5). Provide documents to demonstrate their capabilities and experience. Include lists

of at least 5 completed projects with project names and addresses, names and addresses of Architects and employers, and other information specified.

1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. All material must be USA made with a 30 year manufacturer's warranty.
- C. Source Limitations: Obtain all composite metal ceiling, wall panels and suspension systems from one single source with resources to provide products of consistent quality in appearance, physical properties, and performance.
- D. Surface-Burning Characteristics: Complying with ASTM E 1264 for Class A materials, as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Wood Composite panels must comply with testing per ASTM E84-13a with a Flame Spread of 20 or less and Smoke Developed of 5 or less.
- E. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this project
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Minimum mock-up size to be 10' x 10'.
 - a. Mockup must be large enough to include a minimum of two adjacent panels and demonstrate interface work with lighting, mechanical, anchoring method at structure, and transition to adjacent finishes.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Pre-installation Conference: Conduct conference at Project site.
- H. For composite wood panels: No Urea Formaldehyde.
- I. Provide test data E84-13a for "Standard Method of Test for Surface burning Characteristics of Building materials": Composite material test results of not greater than 20 Flame Spread and 5 Smoke Develop.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical metal wall units and suspension system components in original, unopened packages clearly labeled with the following information: name of manufacturing source and location; product type, description and quantity; clients name and shipping address.

- B. Panel's protective layer to be removed only after installation is complete to help prevent panel surface damage.
- C. Store components in a fully enclosed space where they will be protected against physical damage from direct moisture, significant change in humidity, direct sunlight, significant change in temperature, surface contamination, and any other preventable cause.
- D. Exercise care in handling components to prevent damage to the surfaces and edges and prevent distortion or other physical damage. Comply with prescribed stacking instructions to prevent damage to the components

1.7 PROJECT CONDITIONS

- A. Environmental Limitations
 - 1. Do not install acoustical metal pan walls until after spaces are enclosed and weather tight and after any wet work and work around walls is complete and accepted by project Architect.
 - 2. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Allow materials to reach ambient temperature and humidity for a minimum of 24 hours (48 hours recommended), prior to starting installation.
 - 3. Coordinate with other work supported by, adjacent to or penetrating through the wall system.
- B. Do not install products in exterior space unless the system has been specifically designed and approved for exterior application.
- C. If the project is located within range of moisture associated with large bodies of water (fresh or salt), necessary materials shall be finished with coatings appropriate to condition of use.

1.8 WARRANTY

- A. Provide specified manufacturers warranty against defects in workmanship, discoloration, or other defect considered undesirable by the Architect or Employer.
- B. This warranty shall remain in effect for a minimum period of five (5) years from date of initial acceptance.

1.9 COORDINATION

- A. Coordinate layout and installation of metal panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system, and partition assemblies.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Metal ceilings and wall components: Quantity of each panel, carrier, accessory, and exposed molding and trim equal to 5 percent of quantity installed.

PART 2 - PRODUCTS

2.1 COMPOSITE METAL WALL PANEL

- A. Composite Metal Wall Panel (DWP-#):
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Metalworks W-H 1000 or an equal product by one of the following only: Roll formed aluminum will not be acceptable.
 - a. USG Ceilings Plus Wall Forms
 - b. Milgo-Bufkin (www.milgo-bufkin.com/)
 - c. Lindner USA, Inc. (www.lindner-group.com)
- B. Pan Thickness: Nominal 0.063 inches, so that the panel deflection does not exceed L/360 with metal and drywall backers for impact resistance and to meet acoustical requirements
- C. Edge/ Joint Detail: Panel end joints are butt condition with a splice plate (black) as required. Panel side Joints as per architectural drawings.
- D. Modular Width and Pan Face Width: As per architectural drawings
- E. Panel and suspension Depth: Not more than 1 3/4 inches deep.
- F. Finish: As designated on Legend.
- G. Reinforced Corners: Integral Reinforced corners.
- H. NRC: .95, SD-7 Perforation with PVC Bagged Duct Insulation.
- I. STC: Not less than 50
- J. Sound-Absorptive Fabric Layer: Provide manufacturer's acoustic pads sized to fit concealed surface of panel. Materials shall be both non-flammable and sound-absorptive.
 1. Provide test data E84-13a for "Standard Method of Test for Surface burning Characteristics of Building materials": Composite material test results of not greater than 20 Flame Spread and 5 Smoke Develop.
- K. Metal Wall Panels: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements – LEED."

2.2 Dimensional Acoustical Metal Wall Panel Legend.

- A. Dimensional Acoustical Metal Wall Panels (DWP-1)
 1. Face Perforation Type: LT22 .694" Square Holes @ .700" Straight Centers, 34% open.

2. Finish: TBD.

2.3 METAL SUSPENSION SYSTEMS FOR WALLS

- A. Metal Suspension Standard: Provide panel manufacturer's metal suspension systems of materials and finishes indicated.
 1. Hat channels and "Z" Channels and clips to made of minimum 1/8-inch extruded aluminum.
 2. Backer plates to made of minimum 18 gage steel.
 3. Face of hat channels, clips and backer plates to be factory finished matte black unless specified otherwise.
 4. Face of hat channels to be factory slotted to receive panel hooks
 5. Provide suspension system made from extruded aluminum.
- B. Suspension Systems: Provide complete suspensions systems with vertical hat channels, backer plates, trim molding and other suspension components required to support wall and other wall supported construction (some of these parts may be supplied by the installer).
- C. Attachment Devices: Size for five times design load, unless otherwise indicated (supplied by installer)
 1. Provide anchor, for use in the particular application, as approved by the "Structural Engineer of record".
 2. Structural substrate, as indicated to support attachment device, also to be approved by the "Structural Engineer of record".
 3. Anchors specified must provide corrosion resistance as per metal type and application.

2.4 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearances 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

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical metal panels attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of metal panel walls.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other anchors whose installation is specified in other Sections.
- B. Measure each wall area and establish layout of acoustical metal pan units to balance border widths at opposite edges of each wall. Avoid using less-than-half-width units at borders, and comply with layout shown on elevation plan layouts.
- C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.3 INSTALLATION

- A. General: Install acoustical metal pan walls, per manufacturers shop drawings provided, per manufacturer's written instructions.
- B. Suspend hat channels and backer plates from building's approved structural substrates and as follows:
 - 1. Install hat channels and backer plates plumb and free from contact with insulation or other objects within wall system that are not structural support members
 - 3. Space hangers not more than 48 inches on center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches from ends of each member. Supply supporting calculations from licensed Structural Engineer verifying mount spacing meets all requirements, when spacings exceed those recommended.
 - 4. Fine level suspension to 1/8 inch in 10 feet from specified elevation(s), square and true.
 - 5. Adjust suspension system runners so they are square (within .5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical wall areas and where necessary to conceal edges of acoustical metal pan. Method of edge trim attachment and design of edge trims to be approved by Architect.
 - 1. Screw attach moldings to substrate at intervals not more than 18" O.C. and not more than 6" from ends, leveling with wall suspension system to a tolerance of 1/8" in 10'. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim without prior written approval. Or unless detailed otherwise.
- D. Scribe and cut acoustical metal panel units for accurate fit at penetrations by, other work through walls. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- E. Install acoustical metal panel units in coordination with suspension system.
 - 1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated. Install directionally patterned or

textured panels in directions indicated on approved shop drawings. Panel-joints shall flow smoothly and in a straight line within 1/8" in 10'. Intersections shall be continuous.

2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating wall.
3. Remove protective film from panels only when space is completely clean and free of airborne particles. Use white cotton gloves for final installation of panels into grid system.

3.4 ADJUSTING AND CLEANING

- A. Adjust wall components to provide a consistent finish and appearance in conformity with established tolerances and requirements.
- B. Clean exposed surfaces of acoustical metal panel walls. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

- END OF SECTION 09 84 33 -

SECTION 09 84 36
SOUND-ABSORBING WALL & CEILING PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sound-absorbing wall panels, custom-fabricated and fabric-finished.
- B. Sound-absorbing ceiling baffles, custom-fabricated and fabric-finished.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E795 Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Surface Burning Characteristics (ASTM E84):
 - a. Flamespread: 25 maximum.
 - b. Smoke Developed: 105 maximum.
 - c. Fire ratings for all fabric covered panels is based on testing of the panel wrapped with the standard in stock fabric, Guilford of Maine, FR 701 Style 2100.

1.4 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data sheet, for specified products.
- C. LEED Submittals: Comply with Section 018113
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content panels: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. EQ Credit 2: Low-Emitting Materials.
 - a. For wall panels: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010.
- D. Shop Drawings: Submit shop drawings showing layout, edge profiles and panel components, including anchorage, accessories, finish colors and textures.
- E. Samples: Submit selection and verification samples of finishes, colors and textures.

F. Test Reports: Certified test reports showing compliance with specified performance requirements. All products furnished shall have a flame spread classification of 0-25 for a Class A rating in accordance with ASTM E-84.

1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements and Approvals: Surface Burning Characteristics, ASTM E84: Flamespread 25 or less. Product shall have a Class A Fire Rating.
- B. Wall and Ceiling Panels: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements – LEED."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirements Section.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install panels until wet work, such as concrete and plastering, is complete; the building is enclosed; and the temperature and relative humidity are stabilized at 60 - 80 degrees F (16 - 27 degrees C) and 35% MINIMUM RH and 55% MAXIMUM RH, respectively. All products constructed with wood or wood fiber content must be stored for at least 72 hours in the controlled environment specified herein prior to installation to allow the materials to stabilize.

PART 2 - PRODUCTS

2.1 SOUND-ABSORBING WALL PANELS

- A. MBI Colorsonix Impact Resistant Panels
- B. Acoustical Solutions, Alphasorb High Impact Acoustic Panels
- C. Soundproof Cow, Udderly Quiet Acoustic Panel, 300 Series

2.2 MANUFACTURED WALL PANEL UNITS

- A. Wall Panels:
 1. Thickness: 2 1/8 inches
 2. Size: As indicated on the drawings up to a maximum 48 inches x 120 inches panel.
 3. Core: 2 inch thick fiberglass, 6 - 7 pcf (96 - 112 kg/m³) density, laminated to 1/8 inch thick 16-20 PCF high impact underlayment.
 4. Edge Detail: Square, hardened with non-resin, Class A hardening solution.

5. Facing: 100% polyester fabric, FR 701 Style 2100 by Guilford of Maine
 - a. Color: Colors are to be selected, a minimum of six colors shall be provided.
6. Sound Absorption (ASTM C423): Noise Reduction Coefficient as follows:
 - a. 2 1/8 inches thick panel: NRC 1.05, minimum.
7. Mounting Accessories: Z-clips.

2.3 WALL PANEL FABRICATION

- A. General: Treat fabric wrapped panels using heat shrink process to develop fully taut facing.

2.4 SOUND-ABSORBING CEILING BAFFLES

- A. MBI Cloud-Lite Acoustical Baffles
- B. Acoustical Solutions, AlphaEnviro Sound Baffles

2.5 MANUFACTURED CEILING BAFFLE UNITS

- A. Ceiling Baffles:
 1. Thickness: 2 inches
 2. Size: As indicated on the drawings up to a maximum 48 inches x 120 inches panel.
 3. Core: 2" thick acoustical fiberglass core, 1.65 pcf density.
 4. Facing: Nylon Ripstop Sailcloth
 - a. Color: Colors are to be selected, a minimum of six colors shall be provided.
 5. Sound Absorption (ASTM C423): Noise Reduction Coefficient as follows:
 - a. 2 inch thick panel: NRC 1.35, minimum.
 6. Mounting Accessories: Stainless steel factory installed grommets on width edge.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
 1. Verify that stud spacing is 16 inches (406 mm) o.c., maximum, for panels installed over open studs.
 2. Do not install panels until unsatisfactory conditions are corrected.

3.3 CLEANING

- A. Follow manufacturer's instructions for cleaning panels soiled during installation. Replace panels that cannot be cleaned to as new condition.
- B. Keep site free from accumulation of waste and debris.

- END OF SECTION 09 84 36 -

SECTION 09 90 00
PAINTING & COATING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Section Includes:

1. Paint or natural finish all interior surfaces not specifically excluded. Includes:
 - a. All areas indicated on the drawings and included in the schedule noted to be painted.
 - b. Exposed mechanical and electrical items in areas to be painted.
2. Paint exposed surfaces not factory finished on exterior and interior materials as determined necessary by project Architect to achieve required material protection and desired project esthetics.

B. Exclusions: In addition to material obviously not requiring paint such as stainless steel, plastic laminate, glass, flooring, tile, etc. Do not paint or finish:

1. Surfaces indicated by finish schedule to remain unfinished.
2. Factory finished surfaces indicated to be factory finished.
 - a. Aluminum with anodized or baked-on finish.
 - b. Finish hardware, except hardware with USP finish.
 - c. Electrical devices, fixtures, and trim.
3. Equipment such as mechanical and electrical equipment located inside equipment rooms.

1.2 RELATED SECTIONS

- A. Section 01 74 19 – Construction Waste Management and Disposal.
- B. Section 01 81 13 – Sustainable Design Requirements.
- C. Section 04 20 00 – Unit Masonry.
- D. Section 05 12 00 – Structural Steel Framing.
- E. Section 05 21 00 – Steel Joists.
- F. Section 05 31 23 – Steel Roof Decking.
- G. Section 06 26 14 - Mineral Profile Paneling.
- H. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

- A. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.
- B. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: Indoor Air Quality: Provide products which will not adversely affect indoor air quality through emission of toxic gasses or vapors. If possible, do not use materials with residual of formaldehyde, epoxy resin, or urea-based materials.

1.5 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For paints and coatings, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 4: BPDO – Material Ingredients
 - a. For paints and coatings, if available: Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
- B. Product Data: Provide data on all finishing products and special coatings.
- C. Samples: Submit two samples, 6 x 6 inch in size illustrating selected colors and textures for each color selected.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures, and substrate conditions requiring special attention.
- E. Verify in writing that the products specified will be used as directed or submit for approval a list of comparable materials of another listed approved manufacturer, including full identification of all products by name, color and catalogue number adjacent to those specified, with a statement of equality by the proposed manufacturer.
- F. Submit Manufacturer's certification (MSDS Sheet) for each paint and coating highlighting VOC limits and chemical component limits for review and approval.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years experience.
- B. Applicator: Company specializing in performing the work of this section with minimum five (5) years experience and approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, VOC content, and instructions for mixing and reducing.
- C. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by

manufacturer's instructions. Storage space shall be designated by the Contractor and approved by the Architect.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

1.10 EXTRA MATERIALS

- A. Provide 1 gallon of each color and surface texture used in the facility to the Owner at the completion of the project.
- B. Contractor shall label each container with color, type, texture, and room locations in addition to the manufacturer's label. Contractor shall also provide detailed listing by room of color, type, and texture along with manufacturer's name and identification number.

1.11 MAINTENANCE

- A. Provide under the provisions of Division 1.
- B. Provide maintenance data including information regarding cleaning instructions.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Best quality materials as manufactured by one of following manufacturers will be acceptable:
 - 1. For Brush, Roller or Spray work:
 - a. Sherwin Williams
 - b. Duron
 - c. McCormick
 - d. Benjamin Moore
- B. Quality: All products not specified by name shall be "best grade" or "first line" products of acceptable manufacturers. See Part 3 - Execution for materials required for this project. Where possible, provide materials of single manufacturer.

2.2 MATERIALS

- A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- C. Interior wet-applied paints and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- D. Prohibit Methylene chloride and perchloroethylene in paints and coatings.

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish. See finish drawings for quantity of colors and accent paint locations.
- B. Hollow metal doors and frames will be painted as follows: two paint colors will be selected for interior doors and two paint colors will be selected for interior frames. Exterior doors and frames will be painted to match the interior door and frame colors at their inner face and will be painted a third color on their exterior side.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that substrate conditions are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application to the Architect and Construction Manager.
- C. Test shop applied primer for compatibility with subsequent cover materials.
- D. Allow masonry work to cure for at least 30 days before coating. Gypsum board shall be allowed to dry for 15 days before coating.

3.2 PREPARATION

- A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.
- C. Seal with shellac and seal marks which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Galvanized Surfaces: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

- G. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- I. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
- J. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Painting shall be in accordance with industry standards in reference to preparation of surfaces, environmental conditions, and applications.
- C. Scheduling of painting shall be coordinated to precede installation of finished materials such as flooring, casework, etc. Any finished material installed prior to painting shall be properly protected.
- D. Do not apply finishes to surfaces that are not dry.
- E. Apply each coat to uniform finish.
- F. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- G. Sand surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- I. Allow applied coat to dry before next coat is applied.
- J. Prime concealed surfaces of interior and exterior woodwork with primer paint.
- K. Full wall shall be painted where paint is scheduled, including but not limited to portions of wall concealed by casework.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to Mechanical, Plumbing, and Electrical specifications for schedule of color coding and identification banding of equipment, duct work, piping, and conduit.
- B. Paint shop primed equipment.
- C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

- E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- F. Paint exposed conduit and electrical equipment occurring in finished areas.
- G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- H. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. Color band and identify with flow arrows, names and numbering.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- J. Finished work is to be adequately covered with uniform color and finish. The number of coats herein specified being a minimum, this contract shall provide any additional coats to produce a first-class job. Architect may select accent colors or deeptone colors (contrasting bright colors) for interior painted walls or ceilings. Where bright colors are selected, apply extra coats of paint where required to obtain completely opaque surface. Make allowances for 10 percent deep tones in bid. Additional labor or materials used for this purpose not allowable as extra cost.
- K. Objects on Roof: Paint all metal objects on roof including, but not limited to, rooftop mechanical units, flashings, roof drains, vents, exhaust fans, air intake hoods, roof hatches, etc. as specified under ferrous, zinc coated metals.
- L. Allow the following minimum drying time between coats:
 - 1. Exterior work - 48 hours.
 - 2. Interior work - 24 hours.

3.5 PROTECTION AND CLEANING

- A. Protection: Protect floors and adjacent surfaces from paint smears, spatters and droppings.
 - 1. Cover fixtures not to be painted. Mask off areas as required.
 - 2. Finish Hardware: Ensure hardware is removed prior to starting painting operations and that it is replaced only after painting operations have been completed.
 - a. Hardware Removal and Replacement: Section 08 71 00.
- B. Damage to Other Work: Be responsible for damage done to adjacent work. Repair damaged work to satisfaction of Architect. Replace materials damaged to extent that they cannot be restored to their original condition.
- C. Cleaning: Daily clean-up of empty cans, rags, rubbish and other discarded paint materials shall be removed from site by Contractor, in accordance with Federal, State and Local regulations.
- D. Upon completion, clean glass and paint spattered surfaces.

3.6 SCHEDULE OF COATINGS

A. Exterior Paint Systems:

<u>Surface</u>	<u>Area</u>	<u>Type, Luster + Coats</u>
1. Ferrous Metal	New galv. steel lintels, Exposed steel structure, HM Doors & Frames, etc.	1 coat S-W ProCryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry) 2 coats S-W Waterbased Industrial Enamel, B53-300 Series (4 mils wet, 1.6 mils dry per coat)
2. Plastic	PVC Pipe Penetrations,	1 coat Primer: S-W Extreme Bond Primer B51W00150. (10 mils wet, 5 mils dry) 1 coat S-W Duration Exterior Latex Acrylic Gloss Coating, K34 Series (7 mils wet, 2.8 mils dry per coat)

B. Interior Paint Systems:

<u>Surface</u>	<u>Area</u>	<u>Type, Luster & Coats</u>
1. Cementitious Materials	New CMU (Latex)	1 coat: S-W PrepRite Block Filler, B25W25 (16 mils wet, 8 mils dry) 2 coats: S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat)
	New CMU (Epoxy)	1 coat: S-W Pro Industrial Heavy Duty Block Filler B42W00150. 2 coats: S-W Pro Industrial Water-based Catalyzed Epoxy Coating, Eg-Shel B73-360 Series.
2. Gypsum Board	New ceilings, walls, and bulkheads (Latex) - Eg-Shel at all areas	1 coat: S-W ProMar 200 Interior Latex Primer, B28W8200 (4 mils wet, 1.1 mils dry per coat) 2 coats: S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series
	New ceilings, walls, and bulkheads (Epoxy) –	1 coat: S-W ProMar 200 Zero VOC Primer B28W02600 2 coats: S-W Pro Industrial Water-based Catalyzed Epoxy Coating, Eg-Shel B73-300 Series.
3. Ferrous Metal	New louvers, lintels, steel columns, HM Doors & Frames (Latex)	1 coat: S-W ProCryl Universal Metal Primer, B66-310 Series (2-4 mils dry) 2 coats: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series. (4 mils wet, 1.7 mils dry per coat)
	New louvers, lintels, steel columns,	1 coat: S-W ProCryl Universal Metal Primer, B66-310 Series (2-4 mils dry)

	HM Doors & Frames (Epoxy)	2 coats: S-W Pro Industrial Water-based Catalyzed Epoxy Coating, Gloss B73-360 Series.
4. Exposed Structure	Steel joists & deck	1 coat: S-W Macropoxy 646 FC, B58W610 Series (3-10 mils dry) 2 coats: S-W Waterbased Acrolon 100, Extra White Base B65W00721.

- END OF SECTION 09 90 00 -

**SECTION 10 11 00
VISUAL DISPLAY UNITS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Visual display board assemblies.
- 2. Floor-to-ceiling visual display assemblies.
- 3. Display rails.

- B. Related Requirements:

- 1. Section 10 12 00 "Display Cases" for individually framed and enclosed, wall-mounted bulletin boards and for tackboards within display cases.

1.3 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

- B. LEED Submittals: Comply with Section 01 81 13.

- 1. MR Credit 4: BPDO – Material Ingredients.

- a. For display surfaces, if available: Material Ingredient Report.

- 2. EQ Credit 2: Low-Emitting Materials.

- a. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

- b. For composite wood: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

- C. Shop Drawings: For visual display units.

- 1. Include plans, elevations, sections, details, and attachment to other work.
- 2. Show locations of panel joints.

3. Include sections of typical trim members.
 - D. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
 1. Samples of facings for each visual display panel type, indicating color and texture.
 2. Fabric swatches of fabric facings for tackboards.
 3. Actual factory-finish color samples, applied to aluminum substrate.
 4. Include accessory Samples to verify color selected.
 - E. Samples for Verification: For each type of visual display unit indicated.
 1. Visual Display Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: 6-inch- (150-mm-) long sections of each trim profile.
 3. Display Rail: 6-inch- (150-mm-) long section of each type.
 4. Accessories: Full-size Sample of each type of accessory.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified Installer.
 - B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For visual display units to include in maintenance manuals.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.
- 1.8 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period: Fifty (50) years from date of Substantial Completion.
3. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 1. Composite wood: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
 2. Interior wet-applied adhesive: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- 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: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY ("MB", "TB")

- A. Basis-of-Design Product: Subject to compliance with requirements, provide PolyVision Corporation; a³ CeramicSteel Sans , or a comparable product by one of the following:
 1. AARCO Products, Inc.
 2. ADP Lemco.
 3. Claridge Products and Equipment, Inc.
 4. MooreCo, Inc.
 5. Platinum Visual Systems.

- B. Visual Display Board Assembly: Factory fabricated.
 - 1. Assembly: Markerboard and tackboard.
 - 2. Corners: Square.
 - 3. Width: As indicated on Drawings.
 - 4. Height: As indicated on Drawings.
 - 5. Mounting Method: Direct to wall.
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
 - 1. Color: White.
- D. Tackboard Panel: Vinyl-fabric-faced tackboard panel on core indicated.
 - 1. Fabric Wrapped Edge: Wrap edge of tackboard panel with fabric facing.
 - 2. Color and Pattern: As selected by Architect from full range of industry colors.
- E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.
 - 1. Aluminum Finish: Clear anodic finish.
- F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
- G. Chalktray: Manufacturer's standard; continuous.
 - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
 - 2. Location: Bottom of markerboard, unless otherwise noted
 - a. Gymnasium 900: Chalktray at top of markerboard.
- H. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, and continuous paper holder, designed to hold accessories.
 - 1. Size: 1 inch (25 mm) high by full length of visual display unit.
 - 2. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1200 mm) of display rail or fraction thereof.
 - 3. Flag Holder: One for each room.
 - 4. Tackboard Insert Color: As selected by Architect from full range of industry colors.
 - 5. Aluminum Color: Match finish of visual display assembly trim.
 - 6. Location: Tackboards.

2.4 FLOOR-TO-CEILING VISUAL DISPLAY ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ADP Lemco.
 - 2. Claridge Products and Equipment, Inc.
 - 3. Platinum Visual Systems.

- B. Floor-to-Ceiling Markerboard Panel Assemblies: Consisting of markerboard panels with porcelain-enamel facing on core indicated; fabricated for floor-to-ceiling assemblies.
 - 1. Color: White.
- C. Width: As indicated on Drawings.
- D. Height: Full height of wall above base.
- E. Joint Accessories: Manufacturer's standard, exposed color-matched trim or concealed steel spline at butt joints.

2.5 DISPLAY RAILS ("T.S.", "PAPER GRIP")

- A. Basis-of-Design Product: Subject to compliance with requirements, provide STAS paperrail, or a comparable product by one of the following:
 - 1. AARCO Products, Inc.
 - 2. ADP Lemco.
 - 3. Claridge Products and Equipment, Inc.
 - 4. MooreCo, Inc.
 - 5. Platinum Visual Systems.
 - 6. Polyvision Corporation.
- B. Aluminum Display Rail: Manufacturer's standard, extruded-aluminum rail with plastic-impregnated-cork tackable insert.
- C. Tackable Insert Color: As selected by Architect from full range of industry colors.
- D. Size: 1 inch (25 mm) high by length indicated on Drawings.
- E. End Stops: Aluminum.

2.6 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with high-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
 - 1. Face Sheet Thickness: 0.021 inch (0.53 mm) uncoated base metal thickness.
 - 2. Particleboard Core: 1/2 inch (13 mm) thick; with 0.005-inch- (0.127-mm-) thick, aluminum foil backing.
 - 3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.7 TACKBOARD PANELS

- A. Tackboard Panels:
 - 1. Facing: Vinyl fabric.
 - 2. Core: Manufacturer's standard.

2.8 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.
- C. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface-burning characteristics indicated.
- D. Hardboard: ANSI A135.4, tempered.
- E. Particleboard: ANSI A208.1, Grade M-1.
- F. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
- G. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- H. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.
- I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
- J. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 09 91 23 "Interior Painting" and recommended in writing by visual display unit manufacturer for intended substrate.

2.9 GENERAL FINISH REQUIREMENTS

- 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 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.

2.10 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
 - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

- C. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
- D. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.
- E. Natural-Slate Chalkboards: Align and level joints between adjoining panels, and apply manufacturer's recommended joint-filler compound. Hone and finish joints to continuous even plane.
- F. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
 - 1. Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of chalktray.
 - 2. Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of chalktray.
 - 3. Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of chalktray.
- G. Display Rails: Install rails at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than 16 inches (400 mm) o.c.
 - 1. Mounting Height: 48 inches (1219 mm) above finished floor to top of rail.
- H. Floor-to-Ceiling Markerboard Panels: Attach panels to wall surface with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
 - 1. Join adjacent panels with concealed steel splines for smooth alignment.
 - 2. Join adjacent panels with exposed, H-shaped aluminum trim painted to match wall panel.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one (1) removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 00

SECTION 10 12 00 DISPLAY CASES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Display cases.
- B. Related Requirements:
 - 1. Section 10 11 00 "Visual Display Units" for tackboards.

1.3 DEFINITIONS

- A. Display Case: Glazed cabinet with tackboard panel back surface and adjustable shelves.
- B. Tackboard Panel: A material for holding push-pins or tacks typically consisting of a facing; such as fabric, vinyl, or cork; adhered to a substrate; such as fiberboard, hardboard, particleboard.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.
 - 2. Include electrical characteristics for illuminated display cases.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For composite wood: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins
- C. Shop Drawings: For display cases.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show location of seams and joints in tackboard panels.

3. Include sections of typical trim members.
 4. Include diagrams for wiring of illuminated display cases.
- D. Samples for Initial Selection: For each type of exposed finish.
1. Include Samples of tackboard panels and factory-finished trim involving color finish selection.
- E. Samples for Verification: For each type of exposed finish for the following.
1. Tackboard Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: 6-inch- (150-mm-) long sections of each trim profile including corner section.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: For fabrics and tackboard panels, for tests performed by a qualified testing agency.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For display cases to include in maintenance manuals.
- 1.7 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain display cases from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. 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: 75 or less.
 2. Smoke-Developed Index: 450 or less.

- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. LEED Requirements:
 - 1. Composite wood: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

2.3 DISPLAY CASE (DC-#)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc.; Recessed Display Case #374 or a comparable product by one of the following:
 - 1. AARCO Products, Inc.
 - 2. ADP Lemco.
 - 3. Platinum Visual Systems.
- B. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Display Case Cabinet: Extruded aluminum.
 - 2. Face Frame: Aluminum.
 - 3. Aluminum Finish: Clear anodic.
- C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two (2) keys.
 - 1. Thickness: Not less than 6 mm thick.
 - 2. Number of Doors: Two (2) pairs.
- D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 - 1. Shelf Depth: 6 inches (150 mm).
 - 2. Number of Shelves: Three (3).
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards extending full height of display case.
- F. Back Panel: Vinyl-fabric-faced tackboard panel.
 - 1. Color: As selected by Architect from manufacturer's full range.
- G. Illumination System: Concealed top-lighting system consisting of LED- or fluorescent-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - 1. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
 - a. Electrical Characteristics: Single phase, 277 volts.

H. Size:

1. DC-1: 56 inches (1400 mm) wide, by 56 inches (1400 mm) high, by 16 inches (400 mm) deep.
2. DC-2: 120 inches (3000 mm) wide, by 56 inches (1400 mm) high, by 16 inches (400 mm) deep.
3. DC-3: 72 inches (1800 mm) wide, by 56 inches (1400 mm) high, by 24 inches (600 mm) deep.

2.4 TACKBOARD PANELS

- A. Vinyl-Fabric-Faced Tackboard Panel: 1/4-inch- (6-mm-) thick, vinyl-fabric-faced-cork sheet factory laminated to 1/4-inch- (6-mm-) thick hardboard or particleboard backing.

2.5 MATERIALS

- A. Hardboard: ANSI A135.4, tempered.
- B. Fiberboard: ASTM C 208.
- C. Particleboard: ANSI A208.1, Grade M-1.
- D. Hardwood Plywood: HPVA HP-1.
- E. Vinyl Fabric: FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with flame-spread index of 25 or less when tested according to ASTM E 84.
- F. Extruded-Aluminum Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063.
- G. Aluminum Tubing: ASTM B 429/B 429M, Alloy 6063.
- H. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- I. High-Pressure Plastic Laminate: NEMA LD 3.
- J. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.6 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.7 GENERAL FINISH REQUIREMENTS

- 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 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.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
 - 1. Mounting Height: 84 inches (2134 mm) above finished floor to top of cabinet.

- B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches (600 mm) o.c.
- C. Comply with requirements specified elsewhere for connecting illuminated display cases.
- D. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware, as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION 10 12 00

**SECTION 10 14 16
PLAQUES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes plaques.
- B. Related Requirements:
 - 1. Section 10 14 23 "Panel Signage" for signs, with or without frames that are made of materials other than solid metal.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Plaque Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, and Construction Manager.
 - 2. Review and finalize date(s) to be indicated on plaques.
 - 3. Review and finalize names of project participants to be included on plaques.
 - 4. Review cast bronze material samples for color and texture, and enamel materials for color and gloss.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product
- C. Shop Drawings: For plaques.
 - 1. Include fabrication and installation details and attachments to other work.

2. Show plaque mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - D. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.
 1. Include representative Samples of available typestyles and graphic symbols.
 - E. Samples for Verification: For each type of plaque showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 1. Plaques: Sample of finished metal.
 2. Exposed Accessories: Full-size Sample of each accessory type.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For plaques to include in maintenance manuals.
- 1.8 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 1. Interior wet-applied adhesive: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 PLAQUES

- A. Cast Plaque: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.R.K. Ramos.
 - b. Gemini, Inc.

- c. Impact Signs, Inc.
 - d. Metal Arts.
 - e. Southwell Company (The).
- 2. Plaque Material: Cast bronze.
 - 3. Plaque Thickness: 0.25 inch (6.35 mm).
 - 4. Finishes:
 - a. Integral Metal Finish: As selected by Architect from full range of industry finishes.
 - b. Overcoat: Manufacturer's standard baked-on clear coating.
 - 5. Background Texture: As selected by Architect from manufacturer's full range.
 - 6. Integrally Cast Border Style: Raised flat band, polished, with square corner accents with recessed circles.
 - 7. Mounting: Concealed studs.
 - 8. Text and Typeface: Typeface as selected by Architect from manufacturer's full range.
 - 9. Custom Graphics: Product custom color enamel graphics, including conversion of graphics shown on plaque drawing to vector image.

2.3 MATERIALS

- A. Bronze Castings: ASTM B 584, alloy recommended by manufacturer and finisher for finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard, as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Plaque Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque, unless otherwise indicated.
- B. Adhesive: As recommended by plaque manufacturer.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. General: Provide manufacturer's standard plaques according to requirements indicated.
 - 1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean

- exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
 - 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Surface-Engraved Graphics: Machine engrave graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
- 1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
- C. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted plaques to suit plaque construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 CLEAR ORGANIC COATING FOR COPPER-ALLOY FINISHES

- A. Clear Organic Coating: Clear, waterborne, air-drying, acrylic lacquer called "Incralac"; specially developed for coating copper-alloy products; consisting of a solution of methyl methacrylate copolymer with benzotriazole to prevent breakdown of the film in UV light; shop applied in two (2) uniform coats per manufacturer's written instructions, with interim drying between coats and without runs or other surface imperfections, to a total dry film thickness of 1 mil (0.025 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of plaque work.

- B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
 - 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place plaque in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as plaques are installed.
- C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

3.4 PLAQUE SCHEDULE

- A. Plaque 1: State of Maryland plaque (exhibit attached following this Section).
 - 1. Size: 18 inches wide by 12 inches high.
- B. Plaque 2: Frederick County plaque (exhibit attached following this Section).
 - 1. Size: 18 inches wide by 24 inches high.

END OF SECTION 10 14 16

ROCK CREEK SCHOOL

2020



Frederick County Board of Education

Brad W. Young	President
Joy Schaefer	Vice President
Liz Barrett	Board Member
Michael Bunitsky	Board Member
Jay Mason	Board Member
Karen Yoho	Board Member
Paige Tolbard	Student Board Member

Frederick County Council

M.C. Keegan-Ayer	President
Michael Blue	Vice President
Kai Hagen	
Jerry Donald	
Phil Dacey	
Jessica Fitzwater	
Steve McKay	

Superintendent of Schools

Dr. Theresa R. Alban

Architect: Proffitt & Associates & Becker Morgan Group, Inc.
Construction Manager: Dustin Construction

SCHOOL PLAQUE

School plaque for State funded school construction projects (12"x18")

STATE FUNDS FOR THE CONSTRUCTION OF
ROCK CREEK SCHOOL
WERE PROVIDED THROUGH
THE PUBLIC SCHOOL CONSTRUCTION PROGRAM
2020
BOARD OF PUBLIC WORKS
LARRY HOGAN, GOVERNOR
PETER FRANCHOT, COMPTROLLER
NANCY K. KOPP, TREASURER

**SECTION 10 14 23
PANEL SIGNAGE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Panel signs.
- 2. Die-cut vinyl graphics.

- B. Related Requirements:

- 1. Section 01 50 00 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.
- 2. Section 10 14 63 "Electronic Message Signage" for site LED message signs.
- 3. Section 21 05 00 "Common Work Results for Fire Protection" for labels, tags, and nameplates for fire protection systems and equipment.
- 4. Section 22 05 53 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
- 5. Section 23 05 53 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
- 6. Section 26 05 53 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
- 7. Section 26 52 13 "Emergency and Exit Lighting" for illuminated, self-luminous, and photoluminescent exit sign units.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 PREINSTALLATION MEETINGS

- A. Signage Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, signage contractor, and Construction Manager.

2. Coordinate scheduling of meeting with trades impacted by room name and numbering, including but not limited to, mechanical, building automation system (BAS), electrical, fire alarm, and security, and to provide adequate time for Owner review and approval of room names and numbers.
3. Review and finalize room names.
4. Review and finalize room numbering sequence.
5. Review placement of signage types and rooms with multiple signs.
6. Review rooms with blank-off panels mounted on glass behind sign.
7. Review horizontal and vertical mounting location requirements for signs.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals: Comply with Section 01 81 13.
 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
- C. Shop Drawings: For panel signs.
 1. Include fabrication and installation details and attachments to other work.
 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least eighth size.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 1. Panel Signs: Full-size Sample.
 2. Exposed Accessories: Full-size Sample of each accessory type.
 3. Full-size Samples, if approved, will be returned to Contractor for use in Project.
 4. Vinyl graphic applied to glass.

1.7 CLOSEOUT SUBMITTALS

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

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Materials: Pre-perforated paper sign inserts
 1. Quantity: As required to replace all sign inserts not less than five (5) times.

1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and surface preparation, and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of panel sign.
 - 2. Rework mockup, replace products, and repair surrounding work, as required.
 - 3. Do not proceed with remaining work until mockup is approved by Architect.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Interior wet-applied adhesive: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 PANEL SIGNS

- A. Panel Sign: Frameless modular sign system with fixed and changeable messages and characters having uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide APCO Graphics, Inc.; Elevate Frameless Modular Sign System or a comparable product by one of the following:
 - a. ASI Sign Systems, Inc.
 - b. Best Sign Systems, Inc.
 - c. Inpro Corporation.
 - d. Vista System.

2. Solid-Aluminum-Sheet Sign Panels: Aluminum sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:
 - a. Thickness: 0.125 inch (3.18 mm).
 - a. Surface-Applied, Flat Graphics: Direct-print graphic images.
 - b. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
 - c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
3. Solid-Acrylic-Sheet Sign Panels: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph and as follows:
 - a. Thickness: 0.125 inch (3.18 mm).
 - a. Surface-Applied, Flat Graphics: Direct-print graphic images.
 - b. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
4. Laminated Aluminum-Sheet Sign Panels: Aluminum sheet laminated to both sides of phenolic core sheet.
 - a. Composite-Sheet Thickness: 0.125 inch (3.18 mm).
 - b. Surface-Applied, Flat Graphics: Direct-print graphic images.
 - c. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.
5. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: As indicated on Drawings.
 - b. Corner Condition in Elevation: As indicated on Drawings.
6. Chassis: Black anodized aluminum chassis not more than 3/8 inch deep, concealed behind sign panels, recessed into sign panels, with manufacturer's standard concealed, tamper-resistant sign panel attachment method.
7. Chassis Mounting: Surface mounted to wall with concealed anchors.
8. Surface Finish and Applied Graphics:
 - a. Integral Aluminum Finish: Clear anodized.
 - b. Integral Acrylic Sheet Color: As selected by Architect from full range of industry colors.
 - c. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
 - d. Photo-Image Graphics: Manufacturer's standard multicolor, 600-dpi halftone or dot-screen image.
 - e. Overcoat: Manufacturer's standard baked-on clear coating.
9. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range and variable content as scheduled. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 INTERIOR DIE-CUT VINYL GRAPHICS

- A. Type: Field-Applied, Vinyl-Graphics: Custom, full-color, die cut from 3- to 3.5-mil (0.076- to 0.089-mm) thick, vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.

- B. Substrates: Gypsum drywall and glass, as indicated.
- C. Size: As indicated.
- D. Graphics: To be supplied by Owner in vector file format during submittal review process. Examples of similar complexity are provided at the end of this Section.

2.4 PANEL-SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch (1.2-mm) nominal thickness.
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head, spanner-head, or one-way-head slots unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Through Fasteners: Concealed metal fasteners matching sign chassis finish, with type of head indicated, and installed in predrilled holes.
- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish five (5) blank inserts for each sign for Owner's use.
- C. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
 - 1. Aluminum Brackets: Factory finish brackets with black anodized, baked-enamel or powder-coat finish.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Accessible Signage: Install in locations on walls, as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
 - 1. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
 - 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
- D. Field-Applied, Die-Cut Vinyl Signs: Clean and dry substrate. Align sign in final position before removing release liner. Remove release liner in stages, and apply and firmly press sign into final position. Press from the middle outward to obtain good bond without blisters or fish mouths. Remove carrier film without disturbing applied vinyl film.

- E. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.4 SIGN SCHEDULE

- A. Refer to signage schedule following examples for the following:
 - 1. Room-Identification Signs
 - 2. Toilet Room Signs
 - 3. Tactile Exit Signs
- B. Security Interior Room Number Signs
 - 1. Type: Panel sign.
 - 2. Size: 4 inches wide by 2 inches high.
 - 3. Message: Room number.
 - 4. Locations: Inside of room, mounted on door frame, centered on opening.
 - a. Provide at interior doors of classrooms, instructional spaces, and offices.
 - b. Not required at storage rooms, closets, toilet rooms, corridors, vestibules, mechanical rooms, and electrical rooms.
- C. Security Exterior Door Number Signs
 - 1. Type: Aluminum panel sign.
 - 2. Size: 12 inches wide by 12 inches high.
 - 3. Message: Sequential numbers, beginning at 1 for first door to left of main entry when facing building.
 - 4. Locations: All exterior doors except main entry, one sign on exterior and one sign on interior, mounted on wall at 84 inches above finish floor.
 - 5. Mechanically fastened.
- D. Fire/Rescue Services Signs
 - 1. Type: Aluminum panel sign.
 - 2. Size: 12 inches wide by 12 inches high.
 - 3. Message: As required by Frederick County Fire / Rescue Services standards, details 1.3, 6.1.
 - 4. Locations: Fire department connection, sprinkler rise / fire pump room, and main electrical room.
 - 5. Mechanically fastened.

E. Die-Cut Vinyl Signs

1. Main entry door 001/1 on glass of operable leaf, "ENTER HERE", 3" high, black.
2. Serving line doors 502/1 and 502/2, full color graphic images.

3.5 EXAMPLES

- A. Die-Cut Vinyl Signs: Photos show examples with similar level of graphic complexity. Note: Examples provided are for reference only, and are not meant to convey bid information for any other product appearing in the photograph.





EXAMPLES OF DIE CUT VINYL APPLIED TO GLASS

Location	Sign Type	Message	Quantity	Notes	Add Alt #
002	EVU2-D5	Rock Creek School < Health Suite < Alternate School ^ Upper School ^ Aquatic Center ^ Dining ^ Technology Lab > Gymnasium > Library > Arts & Music > Lower School > Middle School > Operations/Maintenance	1	Directory Mount in Commons on wall between door 002/1 and Corr.	
002	EVU1-B1	NO EXIT	1	Mount in Commons at door 002/1	
003	EVU1-B1	EXIT	1	Mount in Corr. at door 003/1	
003	EVU1-B12	Alternate School	1	Mount in Corr. at door 004/1	#2
004	EVU1-B12	Commons	1	Mount in Corr. at door 004/1	#2
005	EVU1-B1	EXIT	1	Mount in Corr. at door 005/1	#2
008	EVU1-A6	008 Operations Storage	1	Exterior Grade	
010	EVU1-B1	EXIT	1	Mount in Corr. at door 010/1	
009	EVU1-B12	Upper School	1	Mount in Corr. at door 011/1	
009	EVU1-B1	NO EXIT	1	Mount in Corr. at door 009/1	
009	EVU1-B1	NO EXIT	1	Mount in Corr. at door 009/2	
009	EVU1-B1	NO EXIT	1	Mount in Corr. at door 009/3	
011	EVU1-B1	EXIT	1	Mount Corr. at door 011/2	
	EVU2-D3	< Administration < Health Suite < Upper School < Alternate School > Aquatic Center > Technology Lab		Directory Mount in Corr. on wall outside Women 313	
013	EVU1-B1	EXIT	1	Mount in Corr. at door 013/1	
015	EVU1-B1	NO EXIT	1	Mount in Corr. at door 015/1	
015	EVU2-D3	< Dining < Aquatic Center < Technology Lab ^ Middle School ^ Operations/Maintenance		Directory Mount in Corr. on wall outside Men Locker Room 601	
017	EVU1-B1	EXIT	1	Mount in Corr. at door 019/4	
017	EVU1-B12	Middle School	1	Mount in Corr. at door 019/4	#4
018	EVU1-A6	018 Operations Storage	1	Exterior Grade	
019	EVU1-B1	EXIT	1	Mount in Corr. at door 019/2	#4
020	EVU1-B12	Lower School	1	Mount in Corr. at door 021/1	
020	EVU1-B1	EXIT	1	Mount in Corr. at door 020A/1	
021	EVU1-B1	EXIT	1	Mount in Corr. at door 021/2	
022	EVU2-D3	< Lower School < Middle School < Library < Arts & Music < Operation/Maintenance ^ Gymnasium	1	Directory Mount in Corr. outside Men 902	
100	EVU1-B12	100 Administration	1	Mount in Vest. at door 100/1	

Location	Sign Type	Message	Quantity	Notes	Add Alt #
100	EVU1-B12	100 Administration	1	Mount in Commons at door 100/2	
101	EVU1-A7	101 Secretary	1	Mount in Reception at door 101/1	
102	EVU1-A7	102 Work/Mail Room	2	Mount in Hall at door 102/1 & 102/2	
103	EVU1-A7	103 Assistant Principal	1	Mount in Hall at door 103/1	
104	EVU1-A6	104 Supply/Storage	1	Mount in Hall at door 104/1	
105	EVU1-A7	105 Principal	1	Mount in Hall at door 105/1	
106	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Hall at door 106/1	
107	EVU1-A7	107 Conference	1	Mount in Hall at door 107/1	
108	EVU1-A6	108 Record Storage	1	Mount in Hall at door 108/1	
109	EVU1-B1	STAFF ONLY	1	Mount in Corr. at door 109/1	
200	EVU2-B12	200 Health Suite	2	Mount in Corr. at door 200/1 & 200/2	
201	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Health Suite at door 201/1	
202	EVU1-A7	202 Office	1	Mount in Health Suite at door 202/1	
203	EVU1-A6	203 Storage	1	Mount in Health Suite at door 203/1	
300	EVU1-B12	300 School Store	1	Mount in Corr. at door 300/1	
301	EVU1-R1	STAFF RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door 301/1	
302	EVU1-A6	302 Custodial	1	Mount in Corr. at door 302/1	
303	EVU1-A6	303 Electrical	1	Mount in Corr. at door 303/1	
304	EVU1-A6	304 IDF	1	Mount in Corr. at door 304/1	
305	EVU2-B12	305 Instructional Kitchen	2	Mount in Corr. at door 305/1 and Daily Living at 306/2	
306	EVU2-B12	306 Daily Living Suite	2	Mount in Corr. at door 306/1 and Instructional Kitchen at 306/2	
306A	EVU1-A6	306A Storage	1	Mount in Daily Living at door 306A/1	

Location	Sign Type	Message	Quantity	Notes	Add Alt #
307	EVU1-A6	307 Penthouse Access	1	Mount in Corr. at door 307/1	
308	EVU1-A6	308 Upper School Storage	1	Mount in Corr. at door 308/1	
309	EVU1-A7	309 Itinerant Staff	1	Mount in Corr. at door 309/1	
310	EVU1-A6	310 Mechanical/Electrical	1	Mount in Corr. at door 310/1	
311	EVU1-A6	311 IDF	1	Mount in Corr. at door 311/1	
312	EVU1-A6	312 Custodial	1	Mount in Corr. at door 312/1	
313	EVU1-R1	WOMEN (women & chair symbol)	1	Mount in Corr. at door 313/1	
314	EVU1-R1	MEN (men & chair symbol)	1	Mount in Corr. at door 314/1	
315	EVU2-B12	315 Technology Lab	1	Mount in Corr. at door 315/1	
315	EVU1-B1	EXIT	1	Mount in Tech. Lab at door 315/2	
315A	EVU1-A7	315A TV Lab	1	Mount in Tech. Lab at door 315A/1	
315B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door 315/B	
315C	EVU1-A6	315C Storage	1	Mount in Corr. at door 315C/1	
316	EVU1-R1	STAFF RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door 316/1	
400	EVU1-B1	EXIT	1	Mount in Aquatics at door 400/1	
401	EVU2-B12	Aquatics	1	Mount in Corr. at door 401/1	
401	EVU1-G12	(pool rules & regulations)	1	Mount inside Vestibule	
402	EVU1-R2	Locker Room GIRLS (women & chair symbol) (locker symbol)	2	Mount in Corr. at door 402/1 and Aquatics at 402/2	
403	EVU1-R2	Locker Room BOYS (men & chair symbol) (locker symbol)	2	Mount in Corr. at door 403/1 and Aquatics at 403/2	
404	EVU1-A6	404 Laundry	2	Mount in Corr. at door 404/1 and Aquatics at 404/2	
405	EVU1-A6	405 Storage	1	Mount in Aquatics at door 405/1	
406	EVU1-A7	406 Aquatics Office	1	Mount in Aquatics at door 406/1	
407	EVU1-A6	407 Pump Room	1	Mount in Aquatics at door 407/1	
408	EVU1-A6	408 Storage	1	Exterior Grade	
500	EVU1-A6	Serving Line Entrance	1	Mount in Dining at door 502/1	
500	EVU1-A6	Serving Line Exit	1	Mount in Dining at door 502/2	
500	EVU1-B1	EXIT	2	Mount in Dining at door 500/3 and 500/4	
500	EVU1-B1	NO EXIT	2	Mount in Corr. at door 500/1 and 500/2	
501	EVU1-A6	501 Storage	1	Mount in Dining at door 501/1	
503	EVU1-B1	EXIT	1	Mount in Kitchen Corr. at door 503/1	
505A	EVU1-R1	STAFF RESTROOM (unisex & chair symbol)	1	Mount in Locker Room at door 505A/1	

Location	Sign Type	Message	Quantity	Notes	Add Alt #
506	EVU1-A6	506 Storage	1	Mount in Kitchen at door 506/1	
507	EVU1-A6	507 Dry Storage	1	Mount in Kitchen Corr. at door 507/1	
508	EVU1-A6	508 Office	1	Mount in Kitchen Corr. at door 508/1	
509	EVU1-A6	509 Seclusion	1	Mount in Corr. at door 509/1	
600	EVU1-A7	600 Operations	1	Mount in Corr. at door 600/1	
601	EVU1-R2	Locker Room MEN (men & chair symbol) (locker symbol)	1	Mount in Corr. at door 601/1	
602	EVU1-R2	Locker Room WOMEN (women & chair symbol) (locker symbol)	1	Mount in Corr. at door 602/1	
603	EVU1-A6	603 Storage	1	Mount in Corr. at door 603/1	
604	EVU1-A7	604 Operations Office	1	Mount in Corr. at door 604/1	
605	EVU1-A6	605 Storage	1	Mount in Corr. at door 605/1	
606	EVU1-A7	606 Maintenance Office	1	Mount in Corr. at door 606/1	
607	EVU1-A6	607 Maintenance Storage	1	Mount in Corr. at door 607/1	
608	EVU1-A6	608 Mechanical	2	Mount in Electrical at door 608/1	
608	EVU1-A6	608 Mechanical	1	Exterior Grade - Mount at door 608/2	
609	EVU1-A6	609 Electrical	1	Mount in Mechanical at door 609/1	
609	EVU1-A6	609 Electrical	1	Exterior Grade – Mount at door 608/2	
610	EVU1-A6	610 Middle School Storage	1	Mount in Corr. at door 610/1	
611	EVU1-A6	611 Fire Pump	1	Exterior Grade – Mount at door 611/1	
700	EVU1-A6	700 MDF	1	Mount in Corr. at door 700/1	
701	EVU1-A7	701 Staff Support	1	Mount in Corr. at door 701/1	
702	EVU1-A6	702 Custodial	1	Mount in Corr. at door 702/1	
703	EVU1-R1	STAFF RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door 703/1	
704	EVU1-A7	704 Hearing & Vision	1	Mount in Corr. at door 704/1	
705	EVU1-R1	STAFF RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door 705/1	
706	EVU1-A7	706 Testing	1	Mount in Corr. at door 706/1	
707	EVU1-A7	707 Teacher's Lounge	1	Mount in Corr. at door 707/1	
708	EVU1-A7	708 Math Specialists	1	Mount in Corr. at door 708/1	
708A	EVU1-A6	708A Storage	1	Mount in Math Spec. at door 708A/1	
709	EVU2-B12	709 Maker Lab	1	Mount in Corr. at door 709/1	
709	EVU1-B1	NO EXIT	1	Mount in Make Lab at door 709/2	
709A	EVU1-A6	709A Storage & Kiln	1	Mount in Maker Lab at door 709A/1	
709B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Maker Lab at door 709B	

Location	Sign Type	Message	Quantity	Notes	Add Alt #
710	EVU1-A7	710 Reading Specialists	1	Mount in Corr. at door 710/1	
711	EVU1-A6	711 Lower School Storage	1	Mount in Corr. at door 711/1	
712	EVU1-A6	712 Penthouse Access	1	Mount in Corr. at door 712/1	
714	EVU2-B12	714 Library	1	Mount in Corr. at door 714/1	
714	EVU1-B1	NO EXIT	1	Mount in Library at door 714/2	
714A	EVU1-A7	714A Office/Workroom	1	Mount in Library at door 714A/1	
715	EVU1-A7	715 Adaptive PE Office	1	Mount in Corr. at door 715/1	
716	EVU2-B12	716 Music	1	Mount in Corr. at door 716/1	
716A	EVU1-A6	716A Storage	1	Mount in Music at door 716A/1	
716B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Music at door 716B/1	
717	EVU2-B12	717 Sensory Room	1	Mount in Corr. at door 717/1	
718	EVU2-B12	718 Movement Room	1	Mount in Corr. at door 718/1	
718	EVU1-B1	NO EXIT	1	Mount in Movement at door 718/2	
718A	EVU1-A6	718A Storage	1	Mount in Movement at door 718A/1	
719	EVU1-A6	719 IDF	1	Mount in Corr. at door 719/1	
720	EVU1-A7	OT/PT Office	1	Mount in Corr. at door 720/1	
720	EVU1-B1	NO EXIT	1	Mount in OT/PT at door 720/2	
721	EVU1-A6	721 Laundry	1	Mount in Corr. at door 721/1	
722	EVU1-A6	722 Electrical	1	Mount in Corr. at door 722/1	
723	EVU1-A6	723 Storage	2	Mount Corr. at door 723/1 and OT/PT Office at 723/1	
725	EVU1-A6	725 Adaptive PE Storage	1	Mount in Vest. at door 725/1	
800	EVU1-A7	800 Professional Learning/Planning	1	Mount in Corr. at door 800/1	
801	EVU1-A7	801 Multi-Purpose Room	1	Mount in Corr. at door 801/1	
802	EVU1-A7	802 Health Specialist	1	Mount in Corr. at door 802/1	
803	EVU1-A7	803 Resource Room	1	Mount in Corr. at door 803/1	
804	EVU1-A7	804 Social Worker/Guidance Office	1	Mount in Corr. at door 804/1	
900	EVU2-B12	Gymnasium	2	Mount in Corr. at door 023/1 and 023/2	
900	EVU1-B1	EXIT	2	Mount in Gym at door 900/1 and 900/2	
900B	EVU1-R1	FAMILY RESTROOM (unisex & chair symbol)	1	Mount in Gym at door 900B/1	
900C	EVU1-A6	900C Custodial	1	Mount in Gym at door 900C/1	
901	EVU1-A6	901 Furniture Storage	1	Mount in Gym at door 901/1	
902	EVU1-R1	MEN (men & chair symbol)	1	Mount in Gym Vest. at door 902/1	
903	EVU1-R1	WOMEN (women & chair symbol)	1	Mount in Gym Vest. at door 903/1	
904	EVU1-A7	904 PE Office	1	Mount in hall at door 904/1	
904A	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in PE Office at door 904A/1	
906	EVU1-A6	906 PE Storage	1	Mount in Gym at door 906/1	
906	EVU1-A6	906 PE Storage	1	Exterior Grade	

Location	Sign Type	Message	Quantity	Notes	Add Alt #
907	EVU1-A6	907 PE Storage	2	Mount in Gym at door 907/1 and 907/2	
908	EVU1-A7	908 Parks & Rec Office	1	Mount in Corr. at door 908/1	#1
909	EVU1-A6	909 Custodial	1	Mount in Corr. at door 909/1	#1
910	EVU1-R1	FAMILY RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door 910/1	#1
911	EVU1-R1	WOMEN (women & chair symbol)		Mount in Corr. adjacent to Women 911	#1
912	EVU1-R1	MEN (men & chair symbol)		Mount in Corr. adjacent to Men 912	#1
913A	EVU1-B1	EXIT	1	Mount in Corr. at door 913A/1	#1
913A	EVU1-A6	900 Gymnasium	1	Mount in Corr. at door 913A/2	#1
913A	EVU1-A6	913A Parks & Rec Entrance	1	Mount in Gym at door 913A/1	#1
914	EVU1-A7	914 Parks & Rec Activities Room	1	Mount in Lobby at door 914/2	#1
914	EVU1-B1	EXIT	1	Mount in Activities Room at door 914/2	#1
914	EVU1-A6	914 PARK & Rec Activities Room	1	Mount in Gym at door 914//3	#1
914	EVU1-A6	900 Gymnasium	1	Mount in Activities Room at door 914/3	#1
915	EVU1-A6	915 Parks & Rec Storage	1	Mount in Activities Room at door 915/2	#1
915	EVU1-A6	915 Parks & Rec Storage	1	Mount in Gym at door 915/1	#1
A100	EVU1-A7	A100 Conference	1	Mount in Corr. at door A100/1	#2
A101	EVU1-A6	A101 Storage	1	Mount in Corr. at door A101/1	
A101	EVU1-A7	A101 Work/Mail Room	1	Mount in Corr. at door A101/1	#2
A102	EVU1-R1	STAFF RESTROOM (unisex & chair symbol)	1	Mount in Corr. at door A102/1	#2
A103	EVU1-A7	A103 Office	1	Mount in Corr. at door A103/1	#2
A104	EVU1-A7	A104 Office	1	Mount in Corr. at door A104/1	#2
A105	EVU1-A7	A105 Office	1	Mount in Corr. at door A105/1	#2
A106	EVU1-A7	A106 Office	1	Mount in Corr. at door A106/1	#2
A107	EVU2-B12	A107 Sensory Room	1	Mount in Corr. at door A107/1	#2
A108	EVU1-A7	A108 Office	1	Mount in Corr. at door A108/1	#2
A109	EVU2-B12	A109 Classroom	1	Mount in Corr. at door A109/1	#2
A109A	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door A119A/1	#2
A109B	EVU1-A6	A109A Storage	2	Mount in Classrooms at door A119B/1 and A119B/2	#2
A110	EVU2-B12	A110 Classroom	1	Mount in Corr. at door A110/1	#2
A110A	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door A110A/1	#2
A110B	EVU1-A6	A110B Storage	1	Mount in Classroom at door A110B/1 and Support Room at door A110B/2	#2
A111	EVU1-A6	A111 Seclusion	1	Mount in Corr. at door A111/1	#2
A112	EVU2-B12	A112 Classroom	1	Mount in Corr. at door A112/1	#2
A112A	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door A112A/1	#2
A113	EVU1-A7	A113 Staff Support	1	Mount in Corr. at door A113/1	#2
A114	EVU1-R1	STAFF RESTROOM	1	Mount in Corr. at door A114/1	#2

Location	Sign Type	Message	Quantity	Notes	Add Alt #
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		(unisex & chair symbol)			
A115	EVU1-A7	A115 Support Room	1	Mount in Corr. at door A115/1	#2
B100	EVU1-A7	B100 SLP Office	1	Mount in Corr. at door B100/1	
B101	EVU2-B12	B101 Classroom	1	Mount in Corr. at door B101/1	
B101	EVU1-B1	EXIT	1	Mount in Classroom at door B101/2	
B101A	EVU1-A6	B101B Storage	1	Mount in Classroom at door B101A/1	
B101B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door B101B/1	
B102	EVU2-B12	B102 Classroom	1	Mount in Corr. at door B102/a	
B102A	EVU1-A6	B102A Storage	1	Mount in Classroom at door B102A/1	
B102B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door B102B/1	
B105	EVU2-B12	B105 Classroom	1	Mount in Corr. at door B105/1	
B105A	EVU1-A6	B105A Storage	1	Mount in Classroom at door B105A/1 – Delete sign in Alt. #4	
B105B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door B105B/1	
B105C	EVU1-A6	B105C Seclusion	1	Mount in Classroom at door B105C/1	
B106	EVU2-B12	B106 Classroom	1	Mount in Corr. at door B106/1	
B106A	EVU1-A6	B106A Storage	1	Mount in Classroom at door B106A/1	
B106B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door B106B/1	
B107	EVU2-B12	B107 Classroom	1	Mount in Corr. at door B107/1	
B107A	EVU1-A6	B107A Storage	1	Mount in Classroom at door B107A/1	
B107B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door B107B/1	
B108	EVU2-B12	B108 Classroom	1	Mount in Corr. at door B108/1	
B108A	EVU1-A6	B108A Storage	1	Mount in Classroom at door B108A/1	
B108B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door B108B/1	
D100	EVU1-A7	D100 SLP Office	1	Mount in Corr. at door D100/1	
D101	EVU2-B12	D101 Classroom	1	Mount in Corr. at door D101/1	#4
D101A	EVU1-A6	D101A Storage	1	Mount in Classroom at door D101A/1	#4
D101B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door D101B/1	#4
D102	EVU2-B12	D102 Classroom	1	Mount in Corr. at door D102/1	#4
D102A	EVU1-A6	D102A Storage	1	Mount in Classroom at door D102A/1	#4
D102B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door D102B/1	#4
D103	EVU1-B1	EXIT	1	Mount in Shared Learning at door D103/1	#4
D104	EVU2-B12	D104 Classroom	1	Mount in Corr. at door D104/1	#4

Location	Sign Type	Message	Quantity	Notes	Add Alt #
D104A	EVU1-A6	D104A Storage	1	Mount in Classroom at door D104A/1	#4
D104B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door D104B/1	#4
D105	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Shared Learning at door D105/1	#4
D106	EVU1-A6	D106 Seclusion	1	Mount in Corr. at door D106/1	#4
D107	EVU2-B12	D107 Classroom	1	Mount in Corr. at door D107/1	#4
D107A	EVU1-A6	D107A Storage	1	Mount in Classroom at door D107A/1	#4
D107B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door D107B/1	#4
D108	EVU2-B12	D108 Classroom	1	Mount in Corr. at door D108/1	#4
D108A	EVU1-A6	D108A Storage	1	Mount in Classroom at door D108A/1	#4
D108B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door D108B/1	#4
E100	EVU1-A7	E100 SLP Office	1	Mount in Corr. at door E100/1	
E101	EVU2-B12	E101 Classroom	1	Mount in Corr. at door E101/1	
E101A	EVU1-A6	E101A Storage	1	Mount in Classroom at door E101A/1	
E101B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door E101B/1	
E102	EVU2-B12	E102 Classroom	1	Mount in Corr. at door E102/1	
E102A	EVU1-A6	E102A Storage	1	Mount in Classroom at door E102A/1	
E102B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door E102B/1	
E103	EVU2-B12	E103 Classroom	1	Mount in Corr. at door E103/1	
E103A	EVU1-A6	E103A Storage	1	Mount in Classroom at door E103A/1 – Delete sign in Alt. #4	
E103B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door E103B/1	
E104	EVU2-B12	E104 Classroom	1	Mount in Corr. at door E104/1	
E104A	EVU1-A6	E104A Storage	1	Mount in Classroom at door E104A/1	
E104B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door E104B/1	
E107	EVU2-B12	E105 Classroom	1	Mount in Corr. at door E107/1	
E107A	EVU1-A6	E105A Storage	1	Mount in Classroom at door E107A/1	
E107B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door E107B/1	
E108	EVU2-B12	E106 Classroom	1	Mount in Corr. at door E108/1	
E108A	EVU1-A6	E106A Storage	1	Mount in Classroom at door E108A/1	
E108B	EVU1-R1	RESTROOM (unisex & chair symbol)	1	Mount in Classroom at door E108B/1	

END OF SECTION 10 14 23

**SECTION 10 14 63
ELECTRONIC MESSAGE SIGNAGE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Double-sided LED electronic message and backlit identification panel sign.
- B. Related Requirements:
 - 1. Division 03 and 04 for masonry base and foundation for electronic message sign.
 - 2. Division 26 for electric service and connections.

1.3 COORDINATION

- A. Furnish templates and tolerance information for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 SUBMITTALS

- A. Product Data: For each model indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: For each type of sign required.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least 1-1/2 inch scale.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
- D. Samples for Verification: For each type of sign assembly, showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificate: Certificate from manufacturer that product meets FCC requirements.
- B. Evaluation Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of sign manufacturer for installation and maintenance of signs to be provided.
- B. Source Limitations: Obtain sign components through one source from a single manufacturer.
- C. Product Options: Size, profiles, and dimensional requirements of signs are based on the model indicated. Other manufacturers' signs with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- D. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical code, Article 100.
- F. FCC Standards: Provide product tested and labeled to meet requirements of FCC emissions guidelines.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish rough-in dimensions and proceed with fabricating signs without field measurements. Coordinate construction to ensure actual rough-in dimensions correspond to established dimensions.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
 1. Uniform Wind Load: As indicated on Drawing S201.
 2. Concentrated Horizontal Load: As indicated on Drawing S201.
 3. Other Design Load: As indicated on Drawing S201.
 4. Uniform and concentrated loads need not be assumed to act concurrently.
- B. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. 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.

2.2 DOUBLE-FACED LED SIGNS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Watchfire Signs, 16mm pixel pitch, or a comparable product by one of the following:
 1. Daktronics.
 2. Stewart Signs.
- B. Size and Layout: As designated on Drawings.
- C. UL Listing: Sign assembly shall be listed per UL 48.
- D. Displays: Double-sided full-color LED displays for display of text, video, animation, and still images. Both sides shall display same content.
 1. Pixel pitch: 16 mm.
 - a. Virtual pixels, line sharing, or other non-hardware based arrangements are not acceptable.
 2. LED Lifetime Rating (degredation to 50% original brightness under 100% nit output): 100,000 hours.
 3. Brightness: 10,000 nits.

4. Color Capability: 10 million colors minimum.
 5. Color Calibration: Color calibrate sign across entire face of sign and across all modules.
 - a. Bin sorting does not qualify as color calibration.
 6. View Angle:
 - a. Horizontal: 140 degrees.
 - b. Vertical: 70 degrees.
 7. Video Frame Rate: 30 frames per second.
- E. Cabinets: Extruded aluminum cabinet with precision mitered corners, solid welds, and satin black finish. Assemble single face displays within a single cabinet. Protect internal electronic components. Control internal temperature with cooling fans designed for use without filters or other scheduled maintenance.
 - F. Communications Method: Remote cellular connection, including pre-paid data service for lifetime of sign with bandwidth and data capacity sufficient for reasonable programming of sign by user.
 - G. Power Supplies: Individually replaceable without need to replace other components or modules.
 - H. Surge Protection: Provide surge protection for power input and data input.
 - I. Date, Time, and Temperature: Built-in temperature sensor and clock with battery. Date, time, and temperature can be displayed at any point and embedded with your own text or graphics.
 - J. Software: Provide manufacturer's display control software or equivalent cloud-based control system.
 1. Adjustable Brightness & Scheduled Dimming: Program sign to adjust brightness based on site specific sunrise and sunset times. Programming interface shall allow manual override of dimming, and on/off times. Dimming shall occur progressively, without abrupt changes in brightness or flicker.
 2. Programming/scheduling display of messages at set times, up to a year in advance.
 3. Graphics Library: Unlimited lifetime access to manufacturer's animated and static graphics library.
 4. Security: Provide password-protected software interface with encrypted communication to sign.
 5. Diagnostics: Include remote diagnostics and remote internal and external temperature monitoring.
 6. Remote Access: Provide remote access to sign programming software.

2.3 FIXED SIGNS

- A. Fixed Sign: Sign of hollow-box configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 1. Illuminated Sign: Backlighting construction with LED lighting including power supplies, wiring, and other components necessary by LED manufacturer and UL-48. LED illumination shall be even across the entire face of sign and be equivalent in brightness to high-output fluorescent lamps at 1 foot spacing on each face of the sign. Provide access

for service and replacing LEDs using removable faces or access doors. Cabinet construction shall be aluminum with steel only used where required for internal supports. Weld and seal all joints. Finished assembly shall be UL listed Wet.

- a. Power: As indicated on electrical Drawings.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior signs. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.
2. Solid-Sheet Sign Panels and Returns: Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph and as follows:
 - a. Thickness: Manufacturer's standard for size of sign, but not less than 0.125 inches.
 - b. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics projecting from the sign panel.
3. Hollow-Box Sign Frame: Entire perimeter framed with formed-aluminum sheet or extruded aluminum, hollow-box-type frame with vertical edges attached to supports with aluminum fittings. Close top and bottom edges of panels with manufacturer's standard welded seams or extrusions.
 - a. Hollow-Box Depth: As indicated on Drawings.
 - b. Profile: Square.
 - c. Corner Condition in Elevation: Mitered.
 - d. Finish and Color: Match sign-panel face.
4. Posts: Aluminum.
 - a. Shape: Square or rectangular.
 - b. Wall thickness: As required for structural performance, but not less than 1/4 inch.
 - c. Installation Method: Baseplate.
 - d. Finish and Color: Match sign-panel face.
5. Sign-Panel-Face Finish and Applied Graphics:
 - a. Integral Acrylic Sheet Color: As selected by Architect from full range of industry colors.
 - b. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in metallic silver color to match Architect's sample.
 - c. Overcoat: Manufacturer's standard baked-on clear coating.
6. Text and Typeface: Helvetica.

2.4 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D 4802, category SG as standard with manufacturer for each sign, Type UVF (UV filtering). Extruded acrylic is not acceptable.

- D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant, spanner-head or one-way-head slots unless otherwise indicated.
 - 4. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 as appropriate for the substrate.
 - 1. Uses: Securing signs with imposed loads to structure.
 - 2. Type: Torque-controlled, adhesive anchor or adhesive anchor.
 - 3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- D. Anchoring Materials:
 - 1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 - 2. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - a. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.
 2. Mill joints to tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
 4. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
 5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
- B. Sign Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.
1. Coordinate dimensions and attachment methods to produce panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
 2. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
 3. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.
- C. Post Fabrication: Fabricate posts designed for structural performance indicated and of lengths required for installation method indicated for each sign.
1. Aluminum Posts: Manufacturer's standard 0.125-inch- (3.18-mm-) thick, extruded-aluminum tubing unless otherwise indicated, with brackets or slots to engage sign panels. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
 2. Baseplates: Fabricate posts with baseplates welded to bottom of posts. Drill holes in baseplate for anchor-bolt connection.
 - a. Provide preset or drilled-in-place anchor bolts of size required for connecting posts to foundations.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication, but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
- D. Verify that electrical service is correctly sized and located to accommodate signs.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING POSTS

- A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
- B. Baseplate Method:
 - 1. Preset Anchor Bolts: Set post baseplate in position over anchor bolts projecting from concrete foundation, shim and support post to prevent movement, place washers and nuts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.
 - 2. Drilled-in-Place Anchor Bolts: Set post baseplate in position over concrete foundation, locate and drill anchor holes, shim and support post to prevent movement, place washers and anchor bolts, and tighten. Fill shim space with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.5 DEMONSTRATION AND TRAINING

- A. Provide initial programming of sign to Owner's specification.
- B. Engage manufacturer-authorized trainer to provide on-site training of Owner in use, operation, and programming of sign.

END OF SECTION 10 14 63

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking.
2. Section 09 22 16 "Non-Structural Metal Framing" for blocking.
3. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A.** Coordinate requirements for blocking, reinforcing, and other supports concealed within wall.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. LEED Submittals: Comply with Section 01 81 13.

1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content compartments: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value

C. Shop Drawings: For solid-plastic toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

- E. Samples for Verification: Actual sample of finished products for each type of toilet compartment indicated.
 - 1. Size: 6-inch- (152-mm-) square, of same thickness indicated for Work.
 - 2. Include each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates:
 - 1. Product Certificates: For each type of toilet compartment by manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: One (1) hinge(s) with associated fasteners.
 - 2. Latch and Keeper: One (1) latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: One (1) bumper(s) with associated fasteners.
 - 4. Door Pull: One (1) door pull(s) with associated fasteners.
 - 5. Fasteners: Ten (10) fasteners of each size and type.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.
 - 1. Provide partitions and attachments to resist loads of grab bars.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bradley Corporation.
 2. General Partitions Mfg. Corp.
 3. Global Partitions Corp., an ASI Group Company.
 4. Scranton Products.
 5. Yemm & Hart Green Materials.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Floor anchored.
- D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 3. Color and Pattern: One (1) color and pattern in each room as selected by Architect from manufacturer's full range.
- E. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters or 1-3/4-inch- (44-mm-) square aluminum tube with satin finish; with shoe matching that on the pilaster.
- G. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum or stainless steel.
- H. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid polymer.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty operating hardware and accessories.
1. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) thick stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
 2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast-stainless steel latch unit, designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through bolts.

3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through bolts.
 4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast-stainless steel bumper at out-swinging doors. Mount with through bolts.
 5. Door Pull: Manufacturer's heavy-duty, cast-stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.
 - C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M).
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.
- E. Zamac: Not permitted.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes at posts to conceal anchorage.
- E. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PLASTIC TOILET COMPARTMENTS

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two (2) fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately thirty (30) degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.19

**SECTION 10 21 23
CUBICLE CURTAINS AND TRACK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Curtain tracks and carriers.
- 2. Cubicle curtains.

B. Related Requirements:

- 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for supplementary wood framing and blocking for mounting items requiring anchorage.
- 2. Section 09 22 16 "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Include durability, laundry temperature limits, fade resistance, applied curtain treatment, and fire-test-response characteristics for each type of curtain fabric indicated.
- 2. Include data for each type of track.

B. Shop Drawings:

- 1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
- 2. Include details on blocking above ceiling.

C. Samples for Initial Selection: For each type of curtain material indicated.

D. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

- 1. Curtain Fabric: 10-inch- (254-mm-) square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
- 2. Mesh Top: Not less than 10 inches (254 mm) square.
- 3. Curtain Track: Not less than 10 inches (254 mm) long.
- 4. Curtain Carrier: Full-size unit.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Curtains: Provide curtain fabrics with the following characteristics:
 - 1. Launderable to a temperature of not less than 160 deg F (71 deg C).
 - 2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CURTAIN SUPPORT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A. R. Nelson Co.
 - 2. Construction Specialties, Inc.
 - 3. Imperial Fastener Company, Inc.
 - 4. InPro Corporation (IPC).
- B. Extruded-Aluminum Curtain Track: Not less than 1-1/4 inches wide by 3/4 inch high (32 mm wide by 19 mm high); with 0.058-inch (1.47-mm) minimum wall thickness.
 - 1. Curved Track: Factory-fabricated, 12-inch- (305-mm-) radius bends.
 - 2. Finish: Clear anodized.
- C. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
 - 1. End Stop: Nonremovable.
 - 2. Switch Unit: Shuttle and coupling device for rerouting and securing cubicle curtain, with pull chain for switching track.
- D. Curtain Carriers: One-piece nylon glide with chrome-plated steel hook.
- E. Exposed Fasteners: Stainless steel.
- F. Concealed Fasteners: Hot-dip galvanized.

2.3 CURTAINS

- A. Products: Subject to compliance with requirements, provide the following:

1. Substitutions shall be submitted for review by Architect.

B. Cubicle Curtain Fabric:

1. Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.
 - a. Privacy Curtain Type 1 (PC-1): Architex; Remede Privacy Curtains, RX 6010, Summer.
 - b. Privacy Curtain Type 2 (PC-2): Eykon Design Resources; Silhouette, CSI-03 Seashore.
2. Cubicle Curtain Fabric: Curtain manufacturer's standard, 13 gauge opaque vinyl top, translucent vinyl bottom, and mesh top, and permanently flame resistant, stain resistant, and antimicrobial,
 - a. Privacy Curtain Type 3 (PC-3): Inpro Corporation; Clickeze Security Shower Curtain (Style 4), Sharkskin.

- C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches (152 mm) o.c.; machined into top hem.

- D. Mesh Top: Not less than 20-inch- (508-mm-) high mesh top of No. 50 nylon mesh.

- E. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

A. Fabricate curtains as follows:

1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches (305 mm) added fullness.
2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor as follows:
 - a. Cubicle Curtains: 15 inches (381 mm).
3. Mesh Top: Top hem of mesh not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch (13-mm) triple thickness, top hem of curtain fabric.
4. Bottom Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced, and double lockstitched.
5. Side Hems: Not less than 1/2 inch (13 mm) and not more than 1-1/4 inches (32 mm) wide, with double turned edges, and single lockstitched.

- B. Vertical Seams: Not less than 1/2 inch (13 mm) wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, 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.

3.2 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions.
- B. Up to 20 feet (6.0 m) in length, provide track fabricated from single, continuous length.
 - 1. Curtain Track Mounting: Surface.
- C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
 - 1. Mechanically fasten to suspended ceiling grid with screws.
- D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories, as required for a secure and operational installation.
- E. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along full length of curtain, plus an additional carrier.
- F. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION 10 21 23

**SECTION 10 26 00
WALL AND DOOR PROTECTION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Corner guards.

- B. Related Requirements:

- 1. Section 05 50 00 "Metal Fabrications" for steel angle corner guards and pipe guards.
 - 2. Section 08 71 00 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.

- B. LEED Submittals: Comply with Section 01 81 13.

- 1. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

- C. Shop Drawings: For each type of wall and door protection showing locations and extent.

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

- D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.

- 1. Include Samples of accent strips and accessories to verify color selection.

- E. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner Guards: 12 inches (300 mm) long. Include example top caps.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type of exposed plastic material.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two (2) , 48-inch- (1200-mm-) long units.
 2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
 2. Keep plastic materials out of direct sunlight.
 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
 - a. Store corner-guard covers in a vertical position.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.

- b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
- 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS (**CG-#**)

- A. Flush-Mounted, Plastic-Cover Corner Guards (**CG-1**): Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface, installed over retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition; full wall height.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Activar Industries.
 - b. Construction Specialties, Inc.
 - c. Inpro Corporation.
 - d. Pawling Corporation.
 - 2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; as follows:
 - a. Profile: Nominal 2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius.
 - b. Height: 4 feet (1.2 m).
 - c. Color and Texture: As selected by Architect from manufacturer's full range.
 - 3. Continuous Retainer: Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum.
 - 4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
 - 5. Aluminum Cove Base: Nominal 4 inches (100 mm) high.
- B. Fire-Rated, Flush-Mounted, Plastic-Cover Corner Guards (**CG-2**): Manufacturer's standard, PVC-free assembly consisting of snap-on, resilient plastic cover that is flush with adjacent wall surface, installed over continuous retainer and intumescent fire barrier; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition; full wall height.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Activar Construction Products Group, Inc.
 - b. Construction Specialties, Inc.
 - c. Inpro Corporation.
 - d. Pawling Corporation.
 2. Fire Rating: Same rating as wall in which corner guard is installed; UL listed and labeled according to ASTM E1966 or UL 2079.
 3. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; as follows:
 - a. Leg: Nominal 2 inches (50 mm).
 - b. Height: 4 feet (1.2 m).
 - c. Corner Radius: 1/4 inch (6 mm).
 - d. Color and Texture: As selected by Architect from manufacturer's full range.
 4. Retainer: Minimum 0.070-inch- (1.8-mm-) thick, one-piece, extruded aluminum.
 5. Aluminum Cove Base: Nominal 4 inches (100 mm) high.
- C. Surface-Mounted, Metal Corner Guards (**CG-3**): Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. Inpro Corporation.
 - e. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - f. Nystrom, Inc.
 - g. Pawling Corporation.
 2. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0625 inch (1.6 mm).
 - b. Finish: Directional satin, No. 4.
 3. Wing Size: Nominal 2-1/2 by 2-1/2 inches (65 by 65 mm).
 4. Height: 4 feet (1.2 m).
 5. Corner Radius: 1/8 inch (3 mm).
 6. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.

2.4 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

- C. Adhesive: As recommended by protection product manufacturer.
 - 1. Interior wet-applied adhesive: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.5 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.6 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, 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.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings. If not indicated on Drawings, install at heights indicated below:
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm) apart.
 - 3. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
- B. Related Requirements:
 - 1. Section 22 40 00 "Plumbing Fixtures" for under lavatory guards and custodial accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry, as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- B. Samples: Full size, for each exposed product and for each finish specified.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

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

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide basis-of-design product, or comparable product by one of the following;
 - 1. AJW Architectural Products.
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Bradley Corporation.
- C. Toilet Tissue (Jumbo-Roll) Dispenser (**A**):
 - 1. Contractor shall install product furnished by Owner,: NPS Corp.; Universal Jumbo Bath Tissue Dispenser #JTT TWIN DISP.
- D. Liquid-Soap Dispenser (**B**):
 - 1. Contractor shall install product furnished by Owner,: Uline; GOJO Foaming Soap Push Dispenser #H-2557.
- E. Automatic Liquid-Soap Dispenser (**B1**):
 - 1. Contractor shall install product furnished by Owner: Kimberly Clark; #40836 Professional slimline touchless counter-mount soap dispenser with A/C adapter.
 - 2. Coordinate electrical requirements with Division 26.

F. Grab Bar (**C, D, E, F**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; 6806.99x42, 6806.99x36, 6806.99x24, and 6806.99x18 or a comparable product by approved manufacturer.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: Straight, 18 inches (457 mm), 24 inches (610 mm), 36 inches (914 mm), and 42 inches (1,067 mm) long.

G. Swing-up Grab Bar (**S**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley; 8370-107-2 or a comparable product by approved manufacturer.
2. Mounting: Flanges with exposed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: Straight, 30 inches (762 mm) long.

H. Mirror Unit (**G, R**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; B-290-2472 and B-290-1836 or a comparable product by approved manufacturer.
2. Frame: Stainless-steel angle, 0.05 inch (1.3 mm) thick.
 - a. Corners: Welded and ground smooth.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Sizes:
 - a. Accessory **G**: 24 inches wide by 72 inches high.
 - b. Accessory **R**: 18 inches wide by 36 inches high.

I. Paper Towel (**Roll**) Dispenser (**H**):

1. Contractor shall install product furnished by Owner,: NPS Corp; Merfin iView Exclusive Dispenser for Hard Roll Towels #51091B.

J. Automatic Paper Towel (Roll) Dispenser (**H1**):

1. Contractor shall install product furnished by Owner: Kimberly Clark; #29738 Professional MOD E-Series hard roll paper towel dispenser with A/C adapter.
2. Coordinate electrical requirements with Division 26.

K. Paper Towel (Roll) Dispenser (**Q**):

1. Contractor shall install product furnished by Owner,; Dispensing Dynamics International; Auto-Cut Towel Dispenser #HF108-35 White.

L. Automatic Paper Towel (Roll) Dispenser (**Q1**):

1. Contractor shall install product furnished by Owner: Kimberly Clark; #29738 Professional MOD E-Series hard roll paper towel dispenser with A/C adapter.
2. Coordinate electrical requirements with Division 26.

M. Sanitary-Napkin Disposal Unit (**O**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; B-270 or a comparable product by approved manufacturer.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.

B. Folding Shower Seat (**K**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; B-5181 Reversible Folding Shower Seat or a comparable product by approved manufacturer.
2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
4. Mounting Mechanism: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Dimensions: 33 inches wide by 22-5/16 inches deep.

C. Robe Hook (**L**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; B-672 Double Robe Hook or a comparable product by approved manufacturer.
2. Description: Double-prong unit.
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 7 finish (polished).

D. Shower Grab Bar (**M**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; 6806.99x__ and B-6861.99 or a comparable product by approved manufacturer.
2. Mounting: Flanges with concealed fasteners.

3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

E. Shower Curtain Rod (**N**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; B-6047x__ or a comparable product by approved manufacturer.
2. Description: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch- (1.3-mm-) thick stainless steel.
3. Size: Match width of opening.
4. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
5. Finish: Stainless steel, No. 4 finish (satin).

F. Shower Curtain and Hooks (**N**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc.; 204-1 and 204-2 or 204-3 or comparable product by approved manufacturer.
2. Size: Minimum 6 inches (152 mm) wider than opening by 72 inches (1828 mm) high.
3. Material: Vinyl, minimum 0.006 inch (0.15 mm) thick, opaque, matte.
4. Color: White.
5. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
6. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one (1) hook per curtain grommet.

G. L-Shaped Shower Curtain Rod, Curtain, and Hooks (**P**):

1. Basis-of-Design Product: Subject to compliance with requirements, provide TRAX; L-TRAX custom L-shaped Shower Rod or a comparable product by approved manufacturer.
2. Description: Ceiling-mounted aluminum track with nylon curtain glides, nickel-plated steel swivel, drop chain, and hooks, and nylon fabric shower curtain liner.
3. Track Size: 32 inches by 60 inches.
4. Curtain Size: Minimum 6 inches (152 mm) wider than opening by 72 inches (1828 mm) high.
5. Finish: White.

2.4 UNDERLAVATORY GUARDS

A. Underlavatory Guard (**J**):

1. See Plumbing Fixture Specification.

2.5 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Mop and Broom Holder:

1. See Plumbing Fixture Specifications.

2.6 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 43 13
DEFIBRILLATOR CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Automatic electronic defibrillator (AED).
 - 2. Defibrillator cabinet.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Defibrillator Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.
- D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

- B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of defibrillators that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. Defibrillator: Eight (8) years from the date of Substantial Completion.
 - b. Battery: Four (4) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AUTOMATIC EXTERNAL DEFIBRILLATOR AND CABINET (AED)

- A. Basis-of-Design: Subject to compliance with requirements, provide the following:
 - 1. Automatic External Defibrillator: Defibtech, LLC; Lifeline AED.
 - 2. Cabinet: JL Industries, Inc., AED Cabinet #1437F12.
 - 3. Product substitutions shall be made during the bidding period according to the requirements specified in Document 002600 "Procurement Substitution Procedures."
- B. Mounting: Semi-recessed.
- C. Accessories: Provide manufacturer's standard battery pack with standby life of not less than seven (7) years, two (2) sets of defibrillation pads, emergency instruction card, and all other equipment required for proper use and maintenance.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 FABRICATION

- A. Defibrillator 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. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish defibrillator cabinets after assembly.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
- B. Examine defibrillator for proper operation, by running on-board diagnostic.
1. Remove and replace damaged or defective units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semi-recessed defibrillator cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install defibrillator cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Defibrillators Cabinets: Fasten defibrillator cabinets to structure, square and plumb.
1. Unless otherwise indicated, provide recessed defibrillators cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed defibrillators cabinets.
- C. Identification: Apply signage at locations indicated.

- D. Do not installed defibrillator in cabinet until immediately before Substantial Completion.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as emergency-aid specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust defibrillator cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of defibrillator cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace defibrillator cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace defibrillators and cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 43 13

**SECTION 10 44 13
FIRE PROTECTION CABINETS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 16 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 SEQUENCING

- A. Apply decals and vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET (**FEC, FEC-2**)

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide JL Industries, Inc.; a division of the Activar Construction Products Group; Cosmopolitan 1037-L22 and Cosmopolitan FX2 1037-L22 or comparable products by one of the following:
 - a. Fire-End & Croker Corporation.
 - b. Larsens Manufacturing Company.
 - c. MOON American.
 - d. Potter Roemer LLC.
- B. Cabinet Construction:
 - 1. FEC: Nonrated.
 - 2. FEC-2: 1-hour fire rated.
 - a. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick fire-barrier material. Provide factory-drilled mounting holes
- C. Cabinet Material: Cold-rolled 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 to 3-inch (64-mm to 76-mm) backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Stainless-steel sheet.
- G. Door Style: Solid panel with frame.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

I. 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. Recessed Door Handle: ADA-compliant recessed pull.
3. Door Lock: Lock with breakable plastic cam that allows door to be opened during emergency by pulling sharply on door handle.
4. 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 door panel.
 - 2) Application Process: Decals.
 - 3) Lettering Color: Black.
 - 4) Orientation: Vertical.

J. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.

2.3 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. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. 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 (13 mm) thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating 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 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 - 1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
- B. 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.
- C. Identification: Apply decals at locations indicated.

3.4 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 10 44 13

**SECTION 10 44 16
FIRE EXTINGUISHERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 13 "Fire Protection Cabinets."
 - 2. Section 23 38 13 "Commercial-Kitchen Hoods" for fire-extinguishing systems provided as part of commercial-kitchen exhaust hoods.

1.3 ACTION SUBMITTALS

- A. Product Data: 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.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS (FE, FE-K)

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide JL Industries, Inc.; a division of the Activar Construction Products Group; Cosmic 10E and Saturn 25 or a comparable product by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International.
 - c. Badger Fire Protection.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. Guardian Fire Equipment, Inc.
 - g. Kidde Residential and Commercial Division.
 - h. Larsens Manufacturing Company.
 - i. MOON American.
 - j. Potter Roemer LLC.
 - 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.
- B. Wet-Chemical Type (**FE-K**): UL-rated 2-A:1-B:C:K, 2.5-gal. (9.5-L) nominal capacity, with potassium acetate-based chemical in stainless-steel container; with pressure-indicating gage.
- C. Multipurpose Dry-Chemical Type in Steel Container (**FE**): UL-rated 4-A:80-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS (FE, FE-K)

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Brackets: 48 inches (1219 mm) above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 51 13 METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Welded corridor lockers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- E. Samples for Verification: For the following products, in manufacturer's standard size:
 - 1. Lockers and equipment.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 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. The following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five (5) units:
 - a. Blank identification plates.
 - b. Hooks.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.7 FIELD CONDITIONS

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

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Welded Metal Lockers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. LEED Requirements:

1. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content

B. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.3 WELDED CORRIDOR LOCKERS (ML-1, ML-2)

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

1. DeBourgh Mfg. Co.; All American Corridor.
2. Lyon Workspace Products, LLC; All-Welded.
3. Penco Products, Inc; All-Welded.
4. Republic Storage Systems, LLC; All-Welded Ventilated.
5. Superior Lockers; Fully-Framed All-Welded Graduate Corridor.

B. Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
2. Door Style: Unperforated panel.
 - a. Security Vents: Manufacturer's standard, stamped horizontal or vertical.

C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch (1.52-mm) nominal thickness.
2. Backs: 0.048-inch (1.21-mm) nominal thickness.
3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Continuous Hinges: Manufacturer's standard, steel, full height.

F. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and pre-locking.

- a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a pre-locking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
- H. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- I. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: Vertical-end type.
- J. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- K. Boxed End Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- L. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - 2. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with A60 (ZF180) zinc-iron, alloy (galvannealed) coating designation.
- M. Finish: Baked enamel or powder coat.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 - 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups.

Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

H. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.5 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. 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.

3.2 INSTALLATION

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 2. Anchor single rows of metal lockers to walls near top and bottom of lockers and to floor.
- B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
1. Attach hooks with at least two (2) fasteners.
 2. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two (2) aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 2. Attach sloping-top units to metal lockers, with closures at exposed ends.
 3. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

3.5 METAL LOCKER SCHEDULE

- A. ML-1: 12 inches wide by 12 inches deep by 72 inches high, single tier.
- B. ML-2: 12 inches wide by 12 inches deep by 72 inches high, double tier.

END OF SECTION 10 51 13

**SECTION 10 51 26
PLASTIC LOCKERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid Plastic lockers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials.
 - a. For lockers having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings: For lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- E. Samples for Verification: For the following products, in manufacturer's standard size:
 - 1. Lockers and equipment.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 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. Full-size units of the following locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than two (2) units:
 - a. Identification plates.
 - b. Hooks.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for their installation.

1.7 FIELD CONDITIONS

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

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Solid Plastic Lockers: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain solid plastic lockers, and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Recycled Content: Provide HDPE lockers with 100 percent recycled content.
- B. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.
- C. Surface-Burning Characteristics: Comply with NFPA 286 and IBC section 803.1.2; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 SOLID PLASTIC LOCKERS (PL-#)

- A. Basis of Design: Subject to compliance with requirements, provide Scranton Products Duralife Lockers, or a comparable product by one of the following:
 - 1. Bradley; Lenox Locker.
 - 2. Columbia Lockers.
 - 3. General Partitions Manufacturing Corp.
- B. Doors and frame: 0.50 inch (13.00 mm) thick HDPE plastic with ventilation slots.
- C. Body: Tops, Sides, Backs, and Shelves: 3/8 inch (10.00 mm) thick HDPE plastic.
- D. Hinges: Continuous piano hinges, .05 inch/18 gauge (1.27 mm) thick type 304 stainless steel fabricated to wrap around edges of door and frame and attached with stainless steel tamper-resistant screws.
 - 1. Finish: Powder coated to match color of locker.
- E. Handle: Continuous type, ADA/ABA-compliant handle fabricated from injection molded plastic. Capable of accepting various locking mechanisms, fastened to entire length of door.
- F. Identification Plates:
 - 1. Unless otherwise indicated: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
 - 2. Locker Rooms 402 and 403: Receiver for changeable nameplate.
- G. Hooks: Manufacturer's standard two-prong, high impact plastic, mounted to bottom of shelf or divider.

- H. Finish Color:
 - 1. As selected from manufacturer's full color range.
- I. Base: Manufacturer's standard 4" high made from matching 1" thick HDPE.

2.4 FABRICATION

- A. Fabricate locker components square and rigid, finish free from scratches and chips.
- B. Fabricate locker components for snap-together assembly or slide-together dovetail connections providing solid and secure, anti-racking construction pursuant to manufacturer's instructions.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Single-Tier Units: Shelf, one (1) double-prong ceiling hook, and two (2) single-prong wall hooks.
 - 2. Double-Tier Units: One (1) double-prong ceiling hook and two (2) single-prong wall hooks.
- D. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
 - 3. Manufacturer's standard ADA signage.
- E. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
 - 1. Corner fillers, mitered.
- F. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers, 1/2 inch thick. Provide slip-joint filler angle formed to receive filler panel.
- G. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed lockers; finished to match lockers, 3/8 inch thick.
- H. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.
- I. Hardware Attachment: All hinges, handles, hasps, hooks, latch bars, and locks attached with tamper-resistant screws.

2.5 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.

2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. 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.

3.2 INSTALLATION

- A. General: Install lockers in accordance with shop drawings and manufacturer's instructions: level, plumb, and true; shim as required, using concealed shims.
 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking, as required to prevent metal distortion.
 2. Set lockers on prepared locker base.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

- A. Protect Plastic lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

3.5 PLASTIC LOCKER SCHEDULE

- A. PL-1: 12 inches wide by 12 inches deep by 72 inches high, single tier.
- B. PL-2: 12 inches wide by 12 inches deep by 72 inches high, double tier.
- C. PL-3: 12 inches wide by 12 inches deep by 72 inches high, quintuple tier, no doors.

END OF SECTION 10 51 26

**SECTION 10 51 53
LOCKER ROOM BENCHES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Locker room benches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker room bench.
- B. Shop Drawings: For locker room benches.
 - 1. Include plans, sections, and attachment details.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- D. Samples for Verification: In manufacturer's standard size:

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver locker room benches until spaces to receive them are clean, dry, permanent lighting and HVAC is operating, and ready for their installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain locker room benches, and accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.3 LOCKER ROOM BENCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ASI Storage Solutions; ASI Group.
 - 2. Hadrian Manufacturing Inc.
 - 3. Lyon Workspace Products, LLC.
 - 4. Penco Products, Inc.
- B. Provide bench units with overall assembly height of 17-1/2 inches (445 mm).
- C. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
 - 1. Size: 20- to 24-inch- (508- to 610-mm-) wide tops.
 - 2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
- D. Bench Backs: Manufacturer's standard backs to match bench tops and brackets to match pedestals.
- E. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
 - 1. Tubular Steel: 1-1/4-inch- (32-mm-) diameter steel tubing, with 0.1265-inch- (3.2-mm-) thick steel flanges welded at top and base; with baked-enamel finish; anchored with exposed fasteners.
 - a. Color: As selected by Architect from manufacturer's full range.
- F. Materials:
 - 1. Steel Tube: ASTM A500/A500M, cold rolled.

2.4 ACCESSORIES

- A. Fasteners: Stainless steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide stainless steel anchors and inserts for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and floors, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. 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.

3.2 INSTALLATION

- A. Fixed Benches: Provide no fewer than two (2) pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.3 PROTECTION

- A. Protect locker room benches from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace locker room benches that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker room bench manufacturer.

END OF SECTION 10 51 53

SECTION 10 56 13
METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Four-post metal storage shelving.
- B. Related Requirements:
 - 1. Section 11 40 00 "Foodservice Equipment" for metal shelving in kitchen, dry storage, and refrigerated spaces.

1.3 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
- B. Shop Drawings: For metal storage shelving.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include installation details of connectors, lateral bracing, and special bracing.
- C. Samples: For each type of metal storage shelving and for each color specified, in the following sizes:
 - 1. Vertical Supports: 12 inches (305 mm) tall.
 - 2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep (610 mm wide by 305 mm deep).
 - 3. Connectors: Full size.

4. Shelf-Label Holders: Full size.

D. Product Schedule: For metal storage shelving. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.6 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. Shelves: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than five (5) shelves.
2. Shelf-to-Post Connectors: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than ten (10) connectors.
3. Shelf-Label Holders: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than ten (10) holders.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance for Four-Post Metal Storage Shelving: Capable of withstanding the loads indicated according to MH 28.1.

2.2 FOUR-POST METAL STORAGE SHELVING (**MS-#**)

A. Open Four-Post Metal Storage Shelving: Complying with MH 28.1 and field assembled from factory-formed components. Shelves span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

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

- a. Borroughs Corporation; Box Edge Plus.
 - b. EQUIPTO; Iron Grip.
 - c. Penco Products, Inc; Clipper Industrial Shelving.
 - d. Republic Storage Systems, LLC; Rivet Wedge-Lock.
 - e. Safco Products; Boltless Shelving.
 - f. Tennsco; Q-Line.
2. Load-Carrying Capacity per Shelf: 400 lb (181 kg).
3. Posts: Fabricated from hot-rolled steel; in manufacturer's standard shape; with perforations at 1-1/2 inches (38 mm) o.c. to receive shelf-to-post connectors.
 - a. Unit Configuration: Configure shelving units as starter- and add-on unit assemblies.
 - 1) Add-On Shelf Posts: Fabricated from hot-rolled steel, manufacturer's standard shape; perforated to match main posts.
 - b. Post Base: Bolt leveler.
4. Bracing: Manufacturer's standard, single or double diagonal cross bracing.
 - a. Location: At unit back and ends as required for stability, load-carrying capacity of shelves, and number of shelves indicated.
5. Solid-Type Shelves:
 - a. Steel Sheet: Nominal thickness 0.036 inch (0.91 mm) minimum, as required for load-carrying capacity per shelf.
 - b. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
 - c. Fabricate fronts and backs of shelves with vertical edges that are flanged and returned, with edges reinforced with steel bars or channels.
6. Shelf Quantity: Four (4) shelves per shelving unit in addition to top and bottom shelf.
7. Shelf-to-Post Connectors: Manufacturer's standard connectors.
8. Base: Open, with exposed post legs.
9. Overall Unit Width and Depth:
 - a. **MS-1:** 48 inches (1219 mm) wide by 24 inches (610 mm) deep.
 - b. **MS-2:** 36 inches (914 mm) wide by 24 inches (610 mm) deep.
 - c. **MS-3:** 36 inches (914 mm) wide by 12 inches (305 mm) deep.
10. Overall Unit Height: 84 inches (2134 mm).
11. Accessories:
 - a. Shelf-Label Holders: Clear plastic, designed to clip onto front edge of shelf.
12. Steel Finish: Baked enamel or powder coat.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 ANCHORS

- A. Floor Anchors: Galvanized-steel, post-installed expansion anchors, power-actuated fasteners, or threaded concrete screws. Provide number per unit recommended by manufacturer unless additional anchors are indicated in calculations.
- B. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one (1) per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.4 FABRICATION

- A. Fabricate metal storage shelving components to provide field-assembled units that are square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.
 - 1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 2. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 - 3. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- B. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- C. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.
- D. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so surface is smooth after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
 - 5. Connect side-to-side and back-to-back shelving units together.
 - 6. Install shelves in each shelving unit at spacing indicated on Drawings.
 - a. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
- B. Accessories:
 - 1. Shelf-Label Holders: Install one (1) on each shelf.
 - a. Install centered within each shelving unit.

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch (13 mm) in up to 10 feet (3 m) of height, not exceeding 1 inch (25 mm) for heights taller than 10 feet (3 m).

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and re-adjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 56 13

**SECTION 10 73 26.13
METAL WALKWAY COVERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Design, fabrication, and installation of welded extruded aluminum walkway cover systems.
- B. Products furnished, but not installed under this section:
 - 1. Column Sleeves (Styrofoam blockouts).
 - 2. Anchor bolts (if required).
- C. Related Requirements:
 - 1. Section 03 30 00 "Cast-In-Place Concrete."
 - 2. Section 10 73 16.16 "Metal Canopies" for canopies attached to building.
 - 3. Section 33 41 00 "Storm Utility Drainage Piping" for unground connection of drainage.

1.3 REFERENCES

- A. The Aluminum Association (AA):
 - 1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM B 209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.
 - 2. ASTM B 221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

3. ASTM C 150, Specification for Portland Cement.
4. ASTM C 404, Specification for Aggregates for Masonry Grout.

E. American Welding Society (AWS):

1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

1.4 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design Walkways in accordance with The Aluminum Design Manual 2010.
2. Comply with the wind requirements of ASCE 7.
3. Provide an all welded extruded aluminum system complete with internal drainage. Non-welded systems are not acceptable.
4. Provide expansion joints to accommodate temperature changes of 120 degrees F. Provide expansion joints with no metal to metal contact.

B. Performance Requirements:

1. Grout: Compressive strength of 2,000 psi, minimum.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Construction Manager, Installer, manufacturer's representative, Concrete Installer, underground piping Installer, electrical Installer, and other installers whose work interfaces with or affects walkway covers.
2. Review special details, drainage, and condition of other construction that will affect Work.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product, Manufacturer's product information, specifications, and installation instructions for walkway cover components and accessories.

B. LEED Submittals: Comply with Section 01 81 13.

1. MR Credit 3: BPDO – Sourcing of Raw Materials.
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
2. SS Credit 5: Heat Island Reduction.
 - a. For roof surface materials: Documentation indicating initial Solar Reflectance Index (SRI) value or three (3) year aged SRI value.

C. Shop Drawings:

1. Include plans, elevations, sections, keyed details, and attachments to other work.
2. Include details for foundations and attachment of drainage piping.

- D. Samples for Initial Selection: Manufacturer's printed color chart.
- E. Samples for Verification:
 - 1. Include copings made from 12-inch (300-mm) lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.
- F. Delegated Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located. Design calculations shall state that the walkway cover system design complies with the wind requirements of ASCE 7, the stability criteria of applicable building code, and all other governing criteria.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least ten (10) years experience in the design, fabrication, and erection of extruded aluminum walkway cover systems.
- B. Installer Qualifications: Have walkway covers installed by manufacturer, third party installation is not acceptable.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate with construction of adjoining work to provide a leakproof and noncorrosive installation.

1.10 WARRANTY

- A. Special Finish Warranty: 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. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:

1. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content.
 2. Solar Reflectance Index (SRI) for low-sloped roof surface materials: Minimum 82 initial SRI; minimum 64 for 3-year aged SRI.
- B. General Performance: Work shall 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.
- C. Loading: As shown on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Provide products fabricated by Peachtree Protective Covers, Inc., or equivalent product by one of the following:
1. Dittmer Architectural Aluminum.
 2. Avadek Walkway Cover Systems.

2.3 MATERIALS

- A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.
- B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.
- C. Protective Coating for Aluminum Columns Embedded in Concrete: Clear acrylic.
- D. Grout:
1. Portland Cement: ASTM C 150, Type I.
 2. Sand: ASTM C 404.
 3. Water: Potable.
- E. Gaskets: Dry seal santoprene pressure type.
- F. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040 inch, minimum.

2.4 MIXES

- A. Grout: 1 part portland cement to 3 parts sand, add water to produce a pouring consistency.

2.5 FABRICATION

A. General:

1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
2. Welding: In accordance with ANSI/AWS D1.2.
3. Bent Construction: Factory assemble beams to columns to form one-piece rigid bents. Where used make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints can be used if supported by engineering calculations and/or testing.
4. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Assemble deck with sufficient camber to offset dead load deflection.

- B. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage, where indicated. Circular downspout opening in column not acceptable.
- C. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.
- D. Deck: Extruded self-flashing sections interlocking into a composite unit. Provide welded plate closures at deck ends.
- E. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.
- F. Closure: Provide manufacturer's standard closure between underside of deck and beam.
- G. Braces: Provide manufacturer's standard decorative or structural braces as indicated on drawings, with clevis and plate connection to column. Finish plate to match columns. Finish brace and clevis with #4 stainless steel or clear anodized aluminum.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted 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 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.
- D. Aluminum Finish:
1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Color:
 - 1) Top of deck: As required for SRI value.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, completion and cleaning of adjacent concrete, masonry, and roofing work, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Erect protective cover true to line, level, and plumb.
- B. Protect aluminum columns embedded in concrete with clear acrylic.
- C. Fill downspout columns with grout to the discharge level to prevent standing water where indicated on Drawings to spill to grade. Unless otherwise indicated, connect to underground piping.
- D. Install weep holes at top of concrete in non-draining columns to remove condensation.
- E. Provide hairline miters and fitted joints.

3.3 CLEANING AND PROTECTION

- A. Clean all protective cover components promptly after installation.
- B. Protect materials during and after installation.

END OF SECTION 10 73 26.13

SECTION 10 75 16
GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes ground-set flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles.
 - 1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 2. Include section, and details of foundation system.
- C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is indicated on Drawings.
 - 2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Flagpole.
 - b. Concord Industries, Inc.
 - c. Eder Flag Manufacturing Company, Inc.
 - d. Ewing Flagpoles.
 - e. Morgan-Francis Flagpoles and Accessories.
 - f. Pole-Tech Company Inc.
- B. Exposed Height: 30 feet (9 m) and 35 feet (11 m).
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch (1.52-mm) wall thickness with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - 1. Flashing Collar: Same material and finish as flagpole.

2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 - 1. 0.063-inch (1.6-mm) spun aluminum with gold anodic finish.
- B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
 - 1. Halyard Flag Snaps: Chromium-plated bronze swivel snap hooks. Provide snaps to fly two (2) flags on halyard.
 - 2. Provide snaps for the following size flags:
 - a. 3' x 5' storm flag and 4' x 6' flag.

2.5 MISCELLANEOUS MATERIALS

- A. Sand: ASTM C 33/C 33M, fine aggregate.
- B. Elastomeric Joint Sealant: Multicomponent nonsag urethane or single-component neutral-curing silicone joint sealant complying with requirements in Section 07 92 00 "Joint Sealants."
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41.
- C. Gold Anodic Finish: AAMA 611, AA-M32C22A43; gold color.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required, due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Place concrete, as specified in Section 03 30 00 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven (7) days or use nonstaining curing compound.
- F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10 75 16

SECTION 10 82 13
EXTERIOR GRILLES AND SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following:
 - 1. Roof equipment screens, supporting steel framework, gates, and accessories.
- B. Related Requirements:
 - 1. Section 07 42 13.13 "Formed Metal Wall Panels" for perforated metal wall panels.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for counterflashing flashing at roof screens.
 - 3. Section 07 72 00 "Roof Accessories" for curbs.

1.3 PREINSTALLATION MEETING

- A. Convene at job site, at least seven (7) calendar days prior to scheduled beginning of construction activities of this section, to review requirements of Work.
- B. Require attendance by representatives of Construction Manager, installing Contractor and Subcontractor (who will represent the system manufacturer), the roofing and mechanical subcontractors, and other entities affected by construction activities of this section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, fittings, accessories, and finishes.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content grilles and screens: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value
- C. Shop Drawings: Including plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, anchoring, and support. Include details of roof-mounted connections and mountings. Indicate welded connections using standard AWS A2.4 welding symbols, and note net length.

- D. Samples for Initial Selection: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Samples for Verification: For each type of exposed finish required, at least 6 by 12 inches, representing product, shape, and patterns.
- F. Delegated-Design Submittal: For structural components and components resisting wind loads. Include loads, point reactions, and locations for attachment to building's structure.

1.5 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificates: Certify products meet or exceed requirements.
- B. Welders Certificates: Certify welders employed on Work, verifying AWS qualification within previous twelve (12) months.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum five (5) years documented experience in producing pre-manufactured metal-framed equipment screens.
- B. Welders: AWS certified within previous twelve (12) months.
- C. Mockups: Provide a mock-up for evaluation of surface preparation techniques and attachments and application workmanship.
 - 1. Locate in area designated by Architect.
 - 2. Construct mock-up, one full screen section wide, including two (2) roof supports.
 - 3. Do not proceed with remaining work until workmanship, color, and location is approved by Architect.
 - 4. Approved mockup may become part of Work if in acceptable condition at time of Substantial Completion.

1.7 COORDINATION

- A. Coordinate installation of anchorages for flagpoles. Furnish setting drawings, templates, and directions for installing anchorages that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the project site clearly marked for proper identification.
- B. Receive, handle and store materials in conformance with the manufacturers printed instructions.
- C. Store products under cover, in manufacturer's unopened packaging until ready for installation.
- D. Protect metal fabrications from damage by exposure to weather or moisture.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify roof screen dimensions and conditions of the installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating equipment enclosure without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 WARRANTY

- A. Framing System: Provide manufacturer's standard written limited warranty stating that the complete framing system shall be warranted against structural failure due to cracking, buckling, bending, tearing or corrosion arising under normal use and environmental conditions for the coverage period applicable.
 - 1. Warranty Period: Twenty (20) years.
- B. Panel Finish:
 - 1. Provide written warranty stating that the paint finish applied on all equipment enclosure panels will be warranted against chipping, peeling, cracking, fading, or blistering for the coverage period of twenty (20) years.
 - 2. Provide warranty signed by the panel manufacturer and paint finish applicator (if separate from manufacturer).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain exterior grilles and screens as complete systems, including supports, fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design assemblies.
- B. Structural Performance: Exterior grille and screen assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Wind Loads: As indicated on Drawing S201.
- C. Perform welds by an AWS certified welder.

2.3 EXTERIOR SCREENS ("ROOF EQUIPMENT SCREEN")

- A. Basis-of-Design: Subject to compliance with requirements, provide products by RoofScreen Manufacturing, or an equivalent product by one of the following:
 - 1. ATAS International, Inc.
 - 2. Cityscapes, Inc.

2.4 MATERIALS

- A. Square Base Supports: Weldments fabricated from cold rolled steel conforming to ASTM A 1008, fabricated with pre-punched holes in base plate for fastening to roof structure. After fabrication, apply minimum 2 to 4 mil baked on powder coat primer.
 - 1. Height 12 inches (305 mm).
- B. Square Base Support Extensions: Fabricated from same material and finish as base supports.
 - 1. Height 3 inches (76 mm).
- C. Square Base Cap: Weldments fabricated from AISI Type 304 stainless steel with mill finish, and fabricated to overlap base support and flashing boot a minimum of 2 inches (51 mm). Provide moment resisting adjustable connection to attach framing to base cap.
- D. Roof Flashing: Refer to Division 07 section that specifies the roof membrane.
- E. Base Cap Gasket: EPDM with self-adhesive closed cell foam.
- F. Framing: Carbon steel structural tubing in manufacturer's standard sizes, conforming to ASTM A 500 with manufacturer's standard galvanized coating conforming to ASTM B 117 salt spray testing. Provide with wall thickness as determined by structural calculations.
- G. Connector Fittings: Fabricated from AISI Type 304 stainless steel with mill finish.
- H. Steel Z section: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating.
- I. Steel Hat Channel: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating.
- J. Hardware: Bolts, nuts, washers and screws 18-8 stainless steel.
- K. Welding Materials: AWS D1.1; type required for materials being welded.
- L. Panel: Perforated metal wall panel MWP-2 as specified in Section 07 42 13.13 "Formed Metal Wall Panels."
 - 1. Panel Fasteners: No. 14 self-tapping sheet metal screw. Color coat heads to match panel color.
 - 2. Panel Trim: Same material and finish as panel. Configuration as shown on Drawings.

2.5 FABRICATION

- A. Fabricate ends of tubing with flat crimp for connections.
- B. Fit and shop assemble items in largest practical sections, for delivery to site.
- C. Fabricate items with joints tightly fitted and secured.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- F. Fabricate system components so that portions of screen can be dismantled for repairs to equipment being screened and for future roof replacement.
- G. Trim and Closures: Fabricated from (twenty-four) 24 gauge metal and finished with the manufacturer's standard coating system.

2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
- B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and 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.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.7 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General: Install exterior screens where shown and according to Shop Drawings and manufacturer's written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.
- D. Anchor fabrications to structure as indicated.
- E. Separate dissimilar metals and use gasketed fasteners, isolation shim, or isolation tape to eliminate possibility of corrosive or electrolytic action between metals.
- F. Installing components so as not to damage finish surfaces. Touch up as required to repair damaged finishes.
- G. Install flashing boots at base supports as required to provide a watertight connection. Install, as recommended by the roof membrane manufacturer.
- H. Remove all protective masking from material immediately after installation.

3.4 CLEANING AND PROTECTION

- A. Remove all protective masking from framing and trim material immediately after installation. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. Maintain in a clean condition during construction.
- B. Protect installed products until completion of project.
 - 1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
 - 2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.
- C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
- D. Replace metal wall panels and framing members that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 82 13

SECTION 11 13 13 LOADING DOCK BUMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes loading dock bumpers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of loading dock bumper.
- B. Shop Drawings: For dock bumpers. Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.1 DOCK BUMPERS

- A. General: Surface-mounted bumpers; of type, size, and construction indicated; designed to absorb kinetic energy and minimize damage to loading dock structure.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Rite-Hite Corporation; Laminated Dock Bumper or a comparable product by one of the following:
 - a. Chalfant Dock Equipment.
 - b. McGuire, W.B. Co., Inc; Division of Overhead Door Corporation.
- B. Laminated-Tread Dock Bumper: Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- (19-mm-) diameter, steel supporting rods that are welded at one end to 1/4-inch- (6-mm-) thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch (25 mm) of tread plies extending beyond the face of closure angles.
 - 1. Thickness: 4-1/2 inches (114 mm).
 - 2. Horizontal Style: 10 inches (250 mm) high by 24 inches long.
 - 3. Provide two bumpers per truck parking spot, as indicated on Civil Drawings.
- C. Anchorage Devices: Galvanized-steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit

installation type indicated. Hot-dip galvanized according to ASTM A 153/A 153M or ASTM F 2329.

- D. Materials: ASTM 36/A 36M for steel plates, shapes, and bars. Hot-dip galvanize according to ASTM A 123/A 123M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, 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.

3.2 INSTALLATION

- A. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
 - 1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
 - 2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.

3.3 ADJUSTING

- A. After completing installation of exposed, factory-finished dock bumpers, inspect exposed finishes and repair damaged finishes.

END OF SECTION 11 13 13

SECTION 11 21 73
COMMERCIAL LAUNDRY AND DRY CLEANING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Commercial washer extractors.
 - 2. Commercial tumble dryers.
- B. Related Requirements:
 - 1. Section 11 30 13 "Residential Appliances" for residential washer and dryer appliances.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, plumbing characteristics, electrical characteristics, and furnished accessories.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. Water Efficiency Prerequisite 2: Indoor Water Use Reduction and EAp2: Minimum Energy Performance
 - a. Commercial clothes washers: CEE Tier 3A.
 - 1) Water usage in gallons per pound.
- C. Shop Drawings: For each type of product.
 - 1. Include plans, elevations, sections, rough-in dimensions, utility service requirements, pit volume requirements, and attachments to other work.
 - 2. Coordination drawings: Indicate locations of equipment, connections to services, and clearance requirements for equipment access and maintenance.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of commercial laundry equipment.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each commercial appliance to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintains, within 150 miles (241 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- B. Gas-Fuel Conversion: Provide gas-fueled equipment with manufacturer's propane conversion kit installed by a qualified service agency according to manufacturer's written instructions for Project location and type of fuel.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store commercial laundry equipment protected from weather, direct sunlight and temperature extremes. Do not remove packaging prior to storage.
- B. Consult manufacturer if commercial laundry equipment are to be stored for an extended period of time.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's recommendations.

1.10 WARRANTY

- A. Commercial Washer Extractor: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
 - 1. All-parts Warranty Period: Three (3) years from date of Substantial Completion.
 - 2. Limited-parts Warranty Period: Ten (10) years from date of Substantial Completion.
 - a. Assemblies: Frame, outer tub, and cylinder shaft.
 - b. Parts: Bearing housing, cylinder bearings, and bearing seals.
- B. Commercial Tumbler Dryer: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.

1. All-parts Warranty Period: Three (3) years from date of Substantial Completion.
2. Limited Parts Warranty Period: Five (5) years from date of Substantial Completion.
 - a. Assemblies: Base and cabinet for rust and corrosion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain commercial laundry equipment from single source and each type of commercial washer and extractor from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical commercial laundry equipment: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled commercial laundry equipment: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
- C. Energy Efficiency for Commercial Clothes Washers and Washer Extractors
 1. Integrated Modified Energy Factor (MEF): Not less than 2.9 cu.ft. per kWh per cycle.
 2. Integrated Water Factor (IWF): Not more than 3.2 gallons per cu.ft. per cycle.
- D. Accessibility: Where commercial laundry equipment is indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.3 MATERIALS

- A. Commercial Washer Extractor: Stainless Steel, ASTM A 666, Type 304 with No. 4 finish (directional satin finish) on exposed surfaces.
- B. Commercial Tumbler Dryer: Galvanized Steel, ASTM A 653/A 653M, G90 (Z275) coating designation; commercial-quality, cold-rolled steel that is zinc coated by the hot-dip process and chemically treated.

2.4 COMMERCIAL WASHER EXTRACTORS

- A. General:
 1. Type: Freestanding, front-loading unit.
 2. Mounting: Soft-mount.
 3. Controls: Touch-pad controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: 99 wash cycle memory.
 - b. USB connection for programing.

4. Internally piped overflow
 5. Bearing Lubrication: 200 hours or one (1) month minimum between lubrication.
 6. Chemical Supply System:
 - a. Five compartment dry chemical dispensing system.
 - b. Automatic flushing and connections for eleven (11) external supply lines and control signals for eight (8) external supplies.
 7. Appliance Finish: Stainless steel.
- B. 30-pound Commercial Washer Extractor (**CW-2**): Freestanding, front-loading automatic laundry washer extractor for processing water-washed linen items.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Alliance Laundry Systems, LLC; Speed Queen SY30 QED Selector or a comparable product by one of the following:
 - a. Huebsch.
 - b. Maytag; a division of Whirlpool Corporation.
 - c. Uni-Mac.
 2. Dimensions:
 - a. Width: 31.3 inches (795 mm).
 - b. Depth: 37.2 inches (945 mm).
 - c. Height: 48.2 inches (1225 mm).
 3. Wash Cylinder: Stainless steel cylinder tub, front, and top panels.
 - a. Dry Weight Capacity: 30 pounds (13.6 kg).
 - b. Volume: 4.75 cubic feet (135 L).
 4. Electrical Power: 200-240 V, 50-60 Hz, 1/3 phase.
 5. Motor: Manufacturer's standard with built-in overload protector, 4 HP.
 6. Water Supply Inlet Valves: Three 3/4" BSP male connections.
 7. Drain Outlets: One 3" outlet.
- C. 55-pound Commercial Washer Extractor (**CW-3**): Freestanding, front-loading automatic laundry washer extractor for processing water-washed linen items.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Alliance Laundry Systems, LLC; Speed Queen SY55 QED Selector or a comparable product by one of the following:
 - a. Huebsch.
 - b. Maytag; a division of Whirlpool Corporation.
 - c. Uni-Mac.
 2. Dimensions:
 - a. Width: 38.2 inches (970 mm).
 - b. Depth: 38.18 inches (1104 mm).
 - c. Height: 55.5 inches (1410 mm).
 3. Wash Cylinder: Stainless steel cylinder tub, front, and top panels.

- a. Dry Weight Capacity: 55 pounds (25 kg).
- b. Volume: 8.5 cubic feet (241 L).
- 4. Electrical Power: 200-240 V, 50-60 Hz, 1/3 phase.
- 5. Motor: Manufacturer's standard with built-in overload protector, 2 HP.
- 6. Water Supply Inlet Valves: Three 3/4" BSP male connections.
- 7. Drain Outlets: One 3" outlet.

2.5 COMMERCIAL TUMBLER DRYERS

A. General:

- 1. Construction: Heavy duty embossed steel with electrostatically applied baked enamel finish.
- 2. Door: Stainless steel door with safety glass lite and rubber gasket, reversible.
- 3. Control System: Programmable microprocessor with eight (8) auto drying cycles, ability to time dry, and to dry to selectable moisture percentage setting, including variable temperature settings and wrinkle free at end of cycle until door opens or maximum of sixty (60) minutes.
- 4. Lint Filter: Self-cleaning, five hundred seventy-six (576) square inches (3716 sq.cm) depositing lint to large storage area at bottom of tumbler.
- 5. Over-dry Prevention.
- 6. Reversing Operation.

B. 50-pound Commercial Tumbler Dryer (CD-2): Free-standing, front-loading tumbler dryer.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Alliance Laundry Systems, LLC; Speed Queen ST050X or a comparable product by one of the following:
 - a. Huebsch.
 - b. Maytag; a division of Whirlpool Corporation.
 - c. Uni-Mac.
- 2. Type: Freestanding, frontloading, gas unit.
- 3. Dimensions:
 - a. Width: 38.5 inches (980 mm).
 - b. Depth: 46.8 inches (1190 mm).
 - c. Height: 77.3 inches (1960 mm).
- 4. Drum: Manufacturer's standard construction.
 - a. Capacity: 50 pounds (22.7 kg).
- 5. Gas-Dryer Power: 200-240 V, 50-60 Hz, 1/3 phase, 6 A electric; 130,000-Btu/h (38,100-W) gas.
- 6. Exhaust Size: 8 inches (203 mm).

C. 75-pound Commercial Tumbler Dryer (CD-3): Complying with AHAM HLD-1.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Alliance Laundry Systems, LLC; Speed Queen ST075X or a comparable product by one of the following:

- a. Huebsch.
 - b. Maytag; a division of Whirlpool Corporation.
 - c. Uni-Mac.
2. Type: Freestanding, frontloading, gas unit.
3. Dimensions:
 - a. Width: 38.5 inches (980 mm).
 - b. Depth: 53 inches (1350 mm).
 - c. Height: 77.3 inches (1960 mm).
4. Drum: Manufacturer's standard construction.
 - a. Capacity: 75 pounds (34 kg).
5. Gas-Dryer Power: 200-240 V, 50-60 Hz, 1/3 phase, 7 A electric; 165,000-Btu/h (48,360-W) gas.
6. Exhaust Size: 8 inches (203 mm).

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of commercial laundry equipment.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before commercial laundry equipment installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install commercial laundry equipment according to manufacturer's written instructions.
- B. Freestanding Equipment: Place equipment in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each commercial washer extractor and tumbler dryer according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. Commercial laundry equipment will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

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

END OF SECTION 11 21 73

**SECTION 11 28 00
OFFICE EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Literature Racks.
 - 2. Mail Sorters.

1.3 SUBMITTALS

- A. Product Data: Submit applicable reference standards, performance data, and application recommendations and limitations.
- B. Shop Drawings: Submit design and installation drawings showing product components in assembly with adjacent materials and products.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Pack and ship to avoid damage according to manufacturer's recommendations:
 - 1. Finish and assemble components in factory before shipment.
 - 2. Ship components in individual, sealed, labeled cartons.
 - 3. Deliver components to room designated for installation.
- B. Do not accept or install damaged products at the site.
- C. Store products in heated indoor storage near point of installation. Retain protective packaging until installing.

1.5 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install until all mortar, wet and dust producing work is completed.
- B. Field Measurements: Obtain required field measurements from the Contractor and indicate on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Basis-of-Design Product: The design for each item is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one (1) of the other manufacturers specified.

2.2 LITERATURE RACK (LR-1)

- A. Description: Wall-mounted rack containing four adjustable pockets with removable pocket dividers designed to hold 8-1/2"x11" and 4"x9" literature.
- B. Product: 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: Displays2Go; BRWM4XPBK wall rack.
- C. Materials: Aluminum frame with matte black finish and clear acrylic pockets and dividers.
- D. Overall Size: 19-1/2" wide by 5" deep by 55" high.

2.3 MAIL SORTER

- A. Description: Steel sorter with horizontal mail slots and closed back.
- B. Basis-of-Design: Subject to compliance with requirements, provide SAFCO; mail sorter systems or comparable products by one of the following:
 - 1. Charnstrom.
 - 2. Mayline Office Furniture.
- C. Materials: Steel frame construction with factory finish.
- D. Mail pocket size: 11-1/2 inches wide by 15 inches deep, nominally.
- E. Adhesive label holders.
- F. Vertical Mail Sorter at Work / Mail Room 102:
 - 1. Dimensions: 168 inches long by 15 inches deep by 24 to 30 inches tall.
 - 2. Number of Mail Slots: 130 slots.
 - 3. Mail pocket height: 2 to 2-1/2 inches high, nominally.
- G. Vertical Mail Sorter at Work Room A101 (Alternate):
 - 1. Dimensions: 36 inches wide by 16 inches deep by 80 inches tall.
 - 2. Number of Mail Slots: 30 slots.
 - 3. Mail pocket height: 3-1/2 inches high, nominally.

4. Shelves: One fixed shelf at base, one moveable shelf at bottom, and one fixed shelf at top, with holes for shelf dividers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation in accordance with manufacturer's instructions.

3.2 ADJUSTING

- A. Adjust all hardware for smooth operation.

3.3 CLEANING

- A. Remove all packaging materials and construction debris.

END OF SECTION 11 28 00

**SECTION 11 30 13
RESIDENTIAL APPLIANCES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Kitchen exhaust ventilation.
 - 3. Refrigeration appliances.
- B. Related Requirements:
 - 1. Section 11 21 73 "Commercial Laundry and Dry Cleaning Equipment" for commercial washer extractors and tumbler dryers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. Water Efficiency Prerequisite 2: Indoor Water Use Reduction and EAp2: Minimum Energy Performance
 - a. Residential clothes washers: ENERGY STAR.
 - b. Ice machines: ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of appliance.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged in manufacturer's original packaging for storage and identified with labels describing contents.
 - 1. REFR-1 Icemaker Filter: Furnish filters adequate for five (5) years use.
 - 2. IC-1 In-line Icemaker Filter: Furnish filters adequate for five (5) years use at fifty (50) pounds production per day per icemaker.

1.7 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period, except as qualified below:
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Microwave Oven: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the magnetron tube.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
- C. Refrigerator/Freezer, Sealed System: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
 - 1. Warranty Period for Sealed Refrigeration System: Five (5) years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two (2) years from date of Substantial Completion.
- D. Clothes Washer: Limited warranty, including parts and labor for first year and parts thereafter, for on-site service on the product.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:

1. Residential clothes washers: ENERGY STAR labeled.
 2. Ice Machines: ENERGY STAR labeled.
- B. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

2.3 RANGES

- A. Electric Range (RG-1): Freestanding range with one oven and complying with AHAM ER-1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); JS760SLSS or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Summit Appliances.
 - e. Whirlpool Corporation.
 2. Width: 30 inches (762 mm).
 3. Electric Burner Elements: Five (5) .
 - a. Radiant Type: One (1) 100 W, two (2) 1200 W, one (1) 3000 W, and one (1) 3100 W.
 - b. Controls: Digital panel controls, located on panel at front of range.
 4. Oven Features:
 - a. Capacity: 5.3 cu. ft. (0.15 cu. m).
 - b. Operation: Baking, convection, and pyrolytic self-cleaning or catalytic continuous cleaning.
 - c. Broiler: Located in top of oven.
 - d. Oven Door(s): Counterbalanced, removable, with observation window and full-width handle.
 - e. Electric Power Rating:
 - 1) Oven: Manufacturer's standard.
 - 2) Broiler: Manufacturer's standard.
 - f. Controls: Digital panel controls and timer display, located on panel at front of range.
 5. Anti-Tip Device: Manufacturer's standard.
 6. Electric Power Supply: 240 V, 60 Hz, 1 phase, 40 A.
 7. Accessible.
 8. Material: Stainless steel with manufacturer's standard cooktop.
 - a. Color/Finish: Black.

2.4 MICROWAVE OVENS

A. Over-the-Range Microwave Oven (MO-1):

1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); JNM7196SKSS or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Whirlpool Corporation.
2. Mounting: Wall cabinet.
3. Type: Conventional.
4. Dimensions:
 - a. Width: 29-3/4 inches (756 mm).
 - b. Depth: 15-1/2 inches (394 mm).
 - c. Height: 16-1/2 inches (419 mm).
5. Capacity: 1.9 cu. ft.
6. Oven Door: Door with observation window and pull handle.
7. Exhaust Fan: Two-speed fan, nonvented, recirculating type with charcoal filter and with manufacturer's standard capacity.
8. Microwave Power Rating: 1000 W.
9. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
10. Controls: Digital panel controls and timer display.
11. Other Features: Turntable.
12. Accessible.
13. Material: Stainless steel.

B. Built-In Microwave Oven (MO-2):

1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); PEB9159SJSS or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Whirlpool Corporation.
2. Mounting: Wall cabinet.
3. Type: Conventional.
4. Dimensions:
 - a. Width: 21-3/4 inches (552 mm).
 - b. Depth: 20 inches (508 mm).
 - c. Height: 13 inches (330 mm).
5. Capacity: 1.5 cu. ft.
6. Oven Door: Door with observation window and pull handle.
7. Microwave Power Rating: 1000 W.
8. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.

9. Controls: Digital panel controls and timer display.
10. Other Features:
 - a. Turntable.
 - b. Convection cooking with rack.
 - c. Built-in Trim Kit: Manufacturer's standard stainless steel trim kit matching width of cabinet.
 - d. Accessible.
11. Material: Stainless steel.

2.5 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood (EH-1):

1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); J VX5305SJSS or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Summit Appliances.
 - e. Whirlpool Corporation.
2. Type: Wall-mounted, exhaust-hood system.
3. Dimensions:
 - a. Width: 30 inches (762 mm).
 - b. Depth: 20 inches (508 mm).
4. Exhaust Fan: Two-speed fan built into hood and with manufacturer's standard capacity.
 - a. Venting: Convertible between top or rear venting and recirculating operation with charcoal filter.
 - b. Fan Control: Hood-mounted fan switch, with separate hood-light control switch.
5. Finish: Stainless steel.
6. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
7. Features:
 - a. Permanent, washable filter(s) and removable charcoal filter 31.
 - b. Built-in LED lighting.

2.6 REFRIGERATOR/FREEZERS

- ### A. Refrigerator/Freezer (REFR-1): Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); PYE22KSKSS or a comparable product by one of the following:

- a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Summit Appliances.
 - e. Whirlpool Corporation.
 2. Type: Freestanding.
 3. Dimensions:
 - a. Width: 35-3/4 inches (908 mm).
 - b. Depth: 31-3/4 inches (806 mm).
 - c. Height: 70 inches (1778 mm).
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 15.0 cu. ft.
 - b. Freezer Volume: 7.1 cu. ft.
 5. General Features:
 - a. Separate temperature controls for each compartment.
 6. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Compartment Storage: Two (2) vegetable crispers and one (1) full-width meat compartment.
 - c. Door Storage: Modular compartments capable of holding gallon-sized containers.
 - d. Glass shelves with raised edges to contain spills.
 7. Freezer Features: One(1) freezer compartment.
 - a. Automatic defrost.
 - b. Interior light in freezer compartment.
 - c. Full-width wire shelf.
 - d. Automatic icemaker and storage bin.
 8. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 9. Water filtration system for ice maker and door dispenser.
 10. Accessible.
 11. Appliance Color/Finish: Stainless steel.
- B. Refrigerator/Freezer (**REFR-2**): One-door refrigerator with freezer compartment inside and complying with AHAM HRF-1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Summit Appliances; AL54 or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. General Electric Company (GE Appliances).
 - c. KitchenAid; a division of Whirlpool Corporation.
 - d. Maytag; a division of Whirlpool Corporation.
 - e. Whirlpool Corporation.

2. Type: Undercounter.
 3. Dimensions:
 - a. Width: 24 inches (610 mm).
 - b. Depth: 24 inches (610 mm).
 - c. Height: 32 inches (813 mm).
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 4.6 cu. ft.
 - b. Freezer Volume: 0.49 cu. ft.
 5. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 6. Accessible.
 7. Appliance Color/Finish: Stainless steel.
- C. Refrigerator (REFR-3): Under-counter refrigerator, by Owner (not in contract).
- D. Refrigerator (REFR-4): One-door refrigerator complying with AHAM HRF-1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Summit Appliances; FF64BCSS or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. General Electric Company (GE Appliances).
 - c. KitchenAid; a division of Whirlpool Corporation.
 - d. Maytag; a division of Whirlpool Corporation.
 - e. Whirlpool Corporation.
 2. Type: Undercounter.
 3. Dimensions:
 - a. Width: 24 inches (610 mm).
 - b. Depth: 24 inches (610 mm).
 - c. Height: 34 inches (863 mm).
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 4.6 cu. ft.
 5. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 6. Lockable.
 7. Accessible.
 8. Appliance Color/Finish: Stainless steel.

2.7 ICEMAKERS

- A. Icemaker (IC-1):
1. Basis-of-Design Product: Subject to compliance with requirements, provide Summit Appliances; BIM44GADA or a comparable product by one of the following:

- a. General Electric Company (GE Appliances).
 - b. Jenn-Air; a division of Whirlpool Corporation.
 - c. KitchenAid; a division of Whirlpool Corporation.
 - d. Maytag; a division of Whirlpool Corporation.
 - e. Viking Range, LLC; a company of the Middleby Corporation.
 - f. Whirlpool Corporation.
2. Type: Undercounter.
3. Dimensions:
 - a. Width: 14-3/4 inches (375 mm).
 - b. Depth: 24 inches (610 mm).
 - c. Height: 32-3/8 inches (822 mm).
4. Ice Capacity:
 - a. Production: 50 lb (22.7 kg) per day.
 - b. Storage: 25 lb (11.3 kg).
5. Features:
 - a. Automatic defrost.
 - b. Automatic shutoff.
 - c. Defrost drain with pump.
 - d. Accessible.
6. In-line water filtration system: Filter installed in base cabinet adjacent to ice makers, capable of filtering 2,500 gallons per life of each filter, NSF certified.
 - a. Basis-of-Design: GE GXRTDR.
7. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
8. Appliance Color/Finish: Stainless steel.

2.8 CLOTHES WASHERS AND DRYERS

A. Clothes Washer (CW-1): Complying with AHAM HLW-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); GFW450SSMWW or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Samsung.
 - e. Whirlpool Corporation.
2. Type: Stacking, front-loading unit.
3. Dimensions:
 - a. Width: 27 inches (686 mm).
 - b. Depth: 33-1/2 inches (851 mm).

- c. Height: 39-3/4 inches (10104 mm).
- 4. Drum: Perforated stainless steel.
 - a. Capacity: 4.5 cu. ft. (0.13 cu. m).
- 5. Controls: Rotary-dial controls for water-fill levels, wash/rinse water temperatures, and variable-speed and fabric selectors.
 - a. Wash Cycles: Four (4) wash cycles, including regular, delicate, and permanent press.
 - b. Wash Temperatures: Four (4) settings.
- 6. Electrical Power: 120 V, 60 Hz, 1 phase, 15 A.
- 7. Motor: Manufacturer's standard with built-in overload protector.
- 8. Features:
 - a. Self-cleaning lint filter.
 - b. Unbalanced-load compensator.
 - c. Inlet Hoses: Minimum length 60 inches (1525 mm).
 - d. Drain Hoses: Minimum length 48 inches (1220 mm).
 - e. Self-leveling legs.
 - f. Automatic dispenser for bleach, fabric softener, and detergent.
 - g. Spin-cycle safety switch.
 - h. End-of-cycle signal.
 - i. Delay-wash option.
 - j. Electronic temperature control.
 - k. Water levels automatically set.
 - l. Timewise® Technology, to match wash and dry times.
 - m. Designed to stack with approved clothes dryer.
 - n. Accessible.
- 9. ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
- 10. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
- 11. Appliance Finish: Enamel.
 - a. Color: White.
- 12. Front-Panel Finish: Manufacturer's standard.
- B. Clothes Washer (CW-4): CW-1 with manufacturer's standard stacking kit.
- C. Clothes Dryer (CD-1) Complying with AHAM HLD-1.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide General Electric Company (GE Appliances); GFD45ESSMWW or a comparable product by one of the following:
 - a. Electrolux Home Products (Frigidaire).
 - b. KitchenAid; a division of Whirlpool Corporation.
 - c. Maytag; a division of Whirlpool Corporation.
 - d. Samsung.
 - e. Whirlpool Corporation.

2. Type: Stacking, frontloading, electric unit.
3. Dimensions:
 - a. Width: 27 inches (686 mm).
 - b. Depth: 33 inches (838 mm).
 - c. Height: 39-3/8 inches (1000 mm).
4. Drum: Perforated porcelain-enameled steel.
 - a. Capacity: 7.5 cu. ft. (0.21 cu. m).
5. Controls: Rotary-dial controls for drying cycle, temperatures, and fabric selectors.
6. Electric-Dryer Power: 240 V, 60 Hz, 1 phase, 30 A.
7. Features:
 - a. Removable lint filter.
 - b. Electronic temperature and moisture-level-sensor controls.
 - c. End-of-cycle signal.
 - d. Self-leveling legs.
 - e. Antibacterial cycle.
 - f. Auxiliary drying rack.
 - g. Stacking kit to stack dryer over washer.
 - h. Cord: 6-feet long, NEMA 14-30P.
 - i. Designed to stack with approved clothes washer.
 - j. Accessible.
8. Appliance Finish: Enamel.
 - a. Color: White.
9. Front-Panel Finish: Manufacturer's standard.

D. Clothes Dryer (**CD-4**): CD-1 stacked with CW-4 using manufacturer's standard stacking kit.

2.9 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 11 30 13

**SECTION 11 40 00
FOODSERVICE EQUIPMENT**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope: Furnish all labor, materials, services, equipment and appliances required to provide and deliver all foodservice equipment hereinafter specified into the building, uncrate, assemble, hang, set-in-place, level, and completely install, exclusive of final utility connections.
- B. Related Work Specified Elsewhere:
 - 1. All plumbing, electrical and ventilating work required in conjunction with commercial foodservice equipment including rough-in to points indicated on mechanical drawings, and final connections from rough-in points, electrical service to points of connection and final connections shall be by Divisions 22, 23 and 26.
 - 2. Refrigeration work will be done by the Kitchen Equipment Contractor except for electrical and plumbing connections to and between compressors, blower coils, controls, etc. These final connections shall be by Divisions 22 and 26.
 - 3. All traps, steam traps, grease traps, line strainers, tail pieces, valves, mixing valves, backflow preventors, stops, shut-offs, and fittings necessary for equipment specified will be furnished and installed under mechanical contract by Division 22 unless specifically called for otherwise under each item.
 - 4. All line and disconnect switches, safety cut-offs and fittings, convenience boxes or other electrical controls, fittings and connections will be furnished and installed under electrical contract by Division 26, unless specifically indicated otherwise in the item specifications. Starting switches for certain specified pieces of foodservice equipment are to be provided by Kitchen Equipment Contractor. Those starting switches, if furnished loose as standard by Foodservice Manufacturers (other than fabricated items), shall be mounted and wired complete under Division 26.
 - 5. Any sleeves or conduit required for refrigeration, syrup tubing, or carbonation tubing will be furnished and installed under Division 22.
 - 6. Unless specifically called for in the Item Specifications, ventilating fans and all duct work between same and ceiling rough-in openings, and from same to discharge opening in building will be furnished and installed by Division 22.

1.2 DEFINITIONS

- A. All references to the terms "Contractor", "Kitchen Equipment Contractor", or "K.E.C." in the specifications and/or on the drawings shall be defined to mean the Kitchen Equipment Contractor.
- B. All references to the term "Owner" in the specifications and/or on the drawings shall be defined to mean the Owner or Owner's designated representative and the Foodservice Equipment Consultant.
- C. All references to the term "Consultant" or "Foodservice Equipment Consultant" in the specifications and/or on the drawings shall be defined to mean NYIKOS ASSOCIATES, INC. its employees, and authorized representatives and is referred to throughout the contract documents as if singular in number and masculine in gender.

- D. The phrase "The K.E.C. shall" or "by the K.E.C.", as applicable, is understood to be included as a part of each sentence, paragraph or article of these specifications unless otherwise indicated or specified.

1.3 QUALITY ASSURANCE

A. Qualification of Suppliers:

1. Commercial foodservice equipment suppliers shall submit satisfactory evidence of compliance with the following qualifications and conditions to be approved.
 - a. Successful completion of jobs of comparable scope.
 - b. Have manufacturer's authorization to distribute and install specified factory items of equipment.
 - c. Maintain a permanent staff experienced in the installation of foodservice equipment and preparation of professional style rough-in drawings and brochures.
 - d. Maintain or have access to fabrication shop meeting N.S.F. requirements. If other than foodservice equipment suppliers own fabrication shop, obtain Consultant approval of fabrication shop desired to be used.
 - e. Maintain or have access to a readily available stock of repair and replacement parts, together with authorized service personnel.

B. Qualification of Fabricators:

1. Fabricators shall be an N.S.F. approved organization with trained personnel and facilities to properly design, detail and fabricate equipment in accordance with the specifications and standard details contained herein.
2. Custom fabricated equipment shall bear the National Sanitation Foundation seal of approval and listed as such under N.S.F. Standards No. 2 and No. 33.
3. Only one (1) fabricator shall be used for this project, and all equipment will be fabricated at the same shop. Where units cannot be fully shop-fabricated, complete fabrication at project site.
4. Acceptable fabricators are:
 - a. Pro Stainless, Inc., Keyser, WV
 - b. Commercial Stainless, Inc., Bloomsburg, PA
 - c. Keystone Custom Fabricators, Inc.; Elizabeth, PA.
 - d. Southern Equipment Fabricators, Inc.; Columbia, SC
 - e. Stainless Unlimited Inc., Waldorf, MD
 - f. Other fabricators, as approved by Consultant.

C. Qualification of Manufacturers:

1. Manufacturers shall be regularly engaged in the production of items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.

D. Standard Products:

1. Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturer's latest design that complies with the specifications which have been produced and used successfully on other projects and in similar applications.

2. Discrepancies within contract documents should immediately be brought to the attention of the Consultant in writing for clarification prior to fabrication or ordering of standard items.

1.4 PLANS & SPECIFICATIONS

- A. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, drawings shall govern. Bidders should seek clarification of any discrepancies from the Consultant prior to bidding.

1.5 SUBMITTALS

A. General Requirements:

1. Within six (6) weeks or earlier, as required, assemble and submit all shop drawings, rough-in drawings, brochures, color samples, etc. as a complete package. There will be no review of partial submittals.
2. Any and all costs, to all trades and parties involved, arising from delay of project due to non-submittal of the complete package by the K.E.C. within a reasonable time period shall be borne solely by the K.E.C.
3. Identify each submittal by project name, date, contractor, submittal name, and any other necessary information to distinguish it from other submittals.

B. Shop Drawings:

1. Submit shop drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of equipment specified for custom fabrication including all accessories attached to each item.
2. Drawings shall be detailed and fully dimensioned to a minimum scale of 3/4"=1'-0" for plan and elevation views, and 1-1/2"=1'-0" for sections, based on the floor plan(s) and following item specifications. Drawings will be checked for thoroughness, accuracy, completeness, neatness, and returned for corrections, if necessary.

C. Rough-in Drawings:

1. Submit rough-in drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of detailed arrangement plans professionally prepared from architects dimensioned plans (not traced from Contract Documents) at a minimum scale of 1/4"=1'-0".
2. Equipment Layout Plan showing arrangement of all items specified and identified on schedule of equipment listing item number, description, quantity, manufacturer, model number, and remarks.
3. Ventilation Plan showing dimensioned locations of all duct openings for ventilators and dishmachines identifying size, c.f.m. required (exhaust and supply), static pressures, and connection heights.

4. Plumbing/Electrical Plans showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.
5. Special Conditions Plan showing exact dimensions and details of all masonry bases, floor depressions, critical partition locations/heights, wall openings, reinforcing for wall and/or ceiling mounted equipment, and conduit locations for soda and compressed gas lines.

D. Equipment Brochures:

1. Submit electronic files in PDF format of manufacturer's illustrations and technical data for approval prior to procurement. All items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to accurately describe the item to be furnished as specified. Include all deviations from standard information (i.e., voltage, phase, load, etc.).
2. Include a separate information sheet ahead of each illustration sheet showing all service connection sizes, electrical requirements, loads, consumptions, and all accessories specified.
3. Manufacturer's suggested schematic drawings for connection of mechanical and electrical services for such items as booster heaters, disposers, or any other item of equipment that may require the same.

E. Miscellaneous Shop Drawings:

1. Submit electronic files in PDF format of manufactured equipment specified requiring clarification and approval such as, walk-in cooler/freezer drawings, ventilator drawings, utility raceway drawings, and refrigeration system drawings.

F. Operation and Maintenance Manuals:

1. Submit electronic files in PDF format for all mechanically operated equipment of standard manufacture. Include operating and cleaning/maintenance instructions, parts listing, recommended parts inventory listing and purchase source, copy of warranties, and similar applicable information.
2. Brochure covers shall bear the job name, date, and name of contractor.

G. Manufacturer's List:

1. The K.E.C. shall submit in writing a list of all manufacturer's representatives of the food service equipment such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers; to be presented after submission of manufacture data.

H. Samples:

1. Samples of materials, products, and fabrication methods, shall be submitted for approval upon request at no additional cost, before proceeding with work.

I. Re-submission Requirements:

1. Shop Drawings:
 - a. Revise initial drawings as required and resubmit in accordance with submittal procedures.

- b. Indicate on drawings all changes which have been made in addition to those requested by Consultant.
 - 2. Product Data and Samples:
 - a. Submit new data and samples as required for initial submittal.
 - b. Make all re-submittals within fourteen (14) working days from date of Consultants previous action.
- J. Approvals:
 - 1. After approval of the submittals listed above, furnish as many prints and copies as are required for the various trades, the Owner, the Architect, and the Consultant.
 - 2. The approval of the shop drawings will be general and shall not relieve the K.E.C. of responsibility for proper fitting, finishing, quantities, and erection of work in strict accordance with the contract requirements, nor does it relieve him of the responsibility of furnishing material and workmanship not indicated on approved shop drawings but required for the completion of his work.
 - 3. Approval by the Consultant and/or Owner of the manufacturer's data submitted by the K.E.C. does not waive the responsibility of K.E.C. to furnish each item of equipment in complete compliance with the specifications and drawings. Discrepancies between Contract Documents and furnished equipment shall be corrected even after approval and installation of this equipment at no additional cost to the Owner.
- K. LEED Submittal:
 - 1. Provide documentation of VOC content in g/L for adhesives and sealants applied within the building waterproofing envelope. Document no added urea formaldehyde for composite wood.
 - 2. EAc4: Enhanced Refrigerant Management:
 - a. Manufacturer's product data for all equipment with refrigerant charge greater than 0.5 lbs. including tonnage, type of refrigerant, refrigerant charge (lbs/ton), and estimated equipment life.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Equipment shall be delivered to the job site only after the building is weather-safe and vandal-safe.
- B. Storage:
 - 1. Store equipment in an area convenient to the point of installation in such a way that it is protected from the weather and job hazards.
- C. Protection:
 - 1. Wrapping and protective coatings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.
- D. Damage:

1. All responsibility shall rest with the K.E.C. for any damage or loss incurred prior to final acceptance. Such items as may be lost or damaged shall immediately be replaced or repaired to a new condition to the complete satisfaction of and at no additional cost to the Owner.

1.7 JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS

- A. Include the work specified, shown or reasonably infer able as part of foodservice equipment. Portions of this work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

1.8 REGULATIONS AND CODES

- A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section.
 1. N.S.F. Standards: Comply with National Sanitation Foundation Standards and criteria, and provide N.S.F. "Seal of Approval" on each manufactured item and major items of custom-fabricated work.
 2. U.L. Standards: For electrical components and assemblies, provide either U.L. labeled products or, where no labeling service is available, provide a complete index of the components used as selected from the U.L. "Recognized Component Index".
 3. A.N.S.I. Standards: For gas-burning equipment, comply with A.N.S.I. Z21-Series standards. Comply with A.N.S.I. B57.1 for compressed gas cylinder connections and with applicable standards of the Compressed Gas Association for water connection air gaps and vacuum breakers.
 4. A.G.A.: All gas-fired equipment shall be A.G.A. Approved, equipped to operate on the type gas available at the job site and shall contain 100% automatic safety shut-off devices.
 5. N.F.P.A. Standards: Comply with N.F.P.A. Bulletin 96 for exhaust systems and with N.F.P.A. Bulletins 17 & 96, and U.L. 300 for fire extinguishing systems.
 6. A.S.M.E. Code: Comply with A.S.M.E. boiler code requirements for steam generating and steam heated equipment. Provide A.S.M.E. inspection, stamps, and certification of registration with National Board.
 7. National Electric Code: Comply with N.E.C. Volume 5 for electrical wiring and devices included with foodservice equipment.
 8. All authorities having jurisdiction over this type of equipment and/or installation.
 9. Where specifications and/or drawings require mechanical, electrical or refrigeration work to be performed, such work shall be done in strict conformance to other portions of the Base Building Specification which sets forth standards for this type of work.
 10. Where there exists two standards or codes for one type of work, the stricter method shall govern.

1.9 WARRANTY

- A. Warranty in writing all equipment and fabrication against defects and workmanship for a period of two (2) years from date of acceptance.

1. Each piece of mechanical equipment shall be listed, together with the authorized service and repair agency whom the Owner will call should malfunctions occur within the two-year (2) guarantee period.
- B. Refrigeration system compressors shall be warranted for five (5) years by the manufacturer. Free refrigeration service, including parts and labor, shall be furnished for two (2) years from date of acceptance, unless otherwise specified.

1.10 JOB CONDITIONS

- A. Visit the job site to field check actual wall dimensions and roughing-in and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site.
- B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjambes, windows, etc. for the purpose of moving the equipment to its proper location with the Contractor. Any removal and rebuilding of walls, partitions, doorjambes, etc. necessary to place the equipment, or if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the K.E.C., at no additional cost to the Owner.
- C. Notify the Consultant and Owner before fabrication of equipment of any discrepancies between plans and specifications and actual conditions on the job.
- D. Before finished floors, walls, and/or ceilings are in place, physically check the location of all "rough-ins" at the job site. Report discrepancies in writing.
- E. Any changes required after fabrication has been started to ensure equipment accurately fitting the space as it exists and conforming to actual field dimensions on the job shall be made at no additional cost to the Owner.
- F. If special hoisting equipment and operators are required, include such cost as part of the bid for this work.

1.11 CHANGES IN THE WORK

- A. The Owner reserves the right to require reasonable modification to be made in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where more desirable accessibility can be obtained or whose materials cannot be installed because of structural or mechanical conditions encountered. Such changes shall be made at no additional cost to the Owner.

1.12 PATENTS

- A. Hold harmless and save the Owner and its officers, consultants, servants and employees from liability of any nature or kind, including costs and expenses for or on account of any copyrighted, patented, or un-patented invention, process, trademark, design, device, material, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.
- B. If the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner in writing. The contract price shall include all royalties or costs arising from the use of any or all of the above which are, in any way, involved in the contract.

1.13 CONTRACTOR'S WARRANTY

- A. The Contractor represents and warrants:
- B. That he is financially solvent and that he is experienced in and competent to perform the types of work or to furnish the plans, materials, supplies or equipment, to be so performed or furnished by him.
 - 1. That he is familiar with all Federal, State, municipal, and department laws, ordinances, orders, and regulations, which may, in any way, affect the work of those employed therein, including, but not limited to, any special acts relating to the work or to the project of which it is a part.
 - 2. That such temporary and permanent work required by the contract as is to be done by him can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property.
 - 3. That he has carefully examined the plans, specifications, addenda, if any, and the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other materials which may, in any way, affect the work or its performance.
 - 4. That he has satisfied himself as to the existing openings and accesses to the foodservice area through which his equipment shall be required to pass and that he is responsible for his equipment being delivered in as many sections as necessary to conform to the available space dictated by these existing limitations.

1.14 SUBSTITUTIONS

- A. Bids submitted shall be for the specific manufacturer and model, size, capacity, and accessories, as specified or shown on the drawings.
- B. The K.E.C. may quote upon brands and models of equipment other than those specified as a substitute, but he must also bid the primary item. In the event that it is desired to request approval of substitute material, product, article, process, or item of equipment in lieu of that which is specified, submit a written request at the time of submitting bid on a separate sheet attached to, but not part of, the base bid, setting forth the proposed substitution in detail, including an itemized analysis of the addition or deduction in the amount of the contract, if any, which will result if the substitution is approved. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.
- C. The Contractor shall be held responsible for additional costs to himself or any other prime contractor for changes required to install materials, devices, equipment, etc., which the Contractor has substituted for that specified.
- D. The Owner reserves the right to award a contract or contracts based upon the inclusion or exclusion of one or more of the alternate estimates. The description of all workmanship and materials under the various headings of the specifications shall have the same meaning and force when applied to similar workmanship and materials in the alternate. If the descriptions are not specific, the workmanship shall be the best quality and the materials the best commercial grade.
- E. Whenever any product is specified in the Contract Documents by reference to the name, trade

name, make, or catalog number of any manufacturer or supplier, the intent is not to limit competition but to establish a standard of quality which is necessary for the project. Products of other manufacturers meeting the established criteria will be considered. However, please take note that the plumbing, electrical, steam, heating, ventilating, and air-conditioning drawings prepared by the consulting engineers, have been engineered based on the first product named under each item number designation. Therefore, any other product which is submitted for approval in lieu of the primary item specified, shall conform to the rough-in requirements established for the first product named, as well as physical size and building construction requirements.

- F. Any equipment listed, which is not in accordance with the provisions of these specifications, will be rejected. If the Contractor fails to submit for approval within the specified time the list of equipment as required herein, the Consultant shall then have the right to make the final equipment selection. The selection made by the Consultant shall strictly conform to these specifications and will be final and binding, and the items shall be furnished and installed by the Contractor without change in the contract price at the time of completion.
- G. It shall be the responsibility of the K.E.C. to prove that substitutions are equal to specified items. NYIKOS ASSOCIATES, INC. as the Owner's representative, shall be the determining authority as to the acceptability or equality of the substitutions. No substitutions shall be approved after bids are received.

1.15 DESIGN/MODEL CHANGE, DISCONTINUED ITEMS

- A. All equipment specified shall be of latest design. Any improvements made in design and construction of prefabricated items before equipment is actually delivered to the project site, shall be incorporated in equipment, at no additional cost, provided such incorporation does not delay delivery date of equipment.
- B. In the event of an item being discontinued after specified and prior to delivery to project site, the K.E.C. shall be responsible for notifying the Consultant in writing of the discontinued item and request an alternate of equal performance, including all accessories, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.
- B. Means shall be provided to ensure adequate lubrication for all moving parts. All oil holes, grease fittings, and filler caps shall be accessible without the use of tools.
- C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. All guards shall provide easy access to the guarded parts.
- D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by the Consultant and the Owner in lieu of rejection of items of equipment, it shall be the K.E.C.'s responsibility to provide same at no additional cost.
- E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. All gauges for sheet iron and sheet steel shall be U.S. Standard Gauges, and finished

equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

<u>GAUGE</u>	<u>THICKNESS</u>	<u>GAUGE</u>	<u>THICKNESS</u>
#10	0.1406	#16	0.0625
#12	0.1094	#18	0.0500
#14	0.0781	#20	0.0375

- F. Materials or work described in words which have a well known and acceptable trade meaning shall be held to refer to such accepted meanings.

2.2 MATERIALS

A. Refrigeration Systems:

1. Self-contained:
 - a. Whether the units be top-mounted or cabinet-mounted, they shall be started by the K.E.C. and shall be tested for maintenance of temperature.
 - b. All units shall be furnished with condensate evaporators.
2. Remote: Provide and install complete refrigeration system(s), charged, started, and operating properly, according to the Item Specifications and the following.
 - a. Single stage compressors with air-cooled condensers operating within the recommended range of suction discharge pressure of economical operation and within the required capacity.
 - b. All units shall be new and factory assembled, to operate with the refrigerant specified. Refrigerant R-404A shall be used for all medium and low temperature applications. Due to the unsettled nature of refrigerants, no refrigerant shall be used with a phase-out date of less than ten (10) years from the date of installation.
 - c. Compressors shall be accessible hermetic type, Copeland or approved equal, and shall be equipped with high-low pressure control, liquid line drier, sight glass, suction and discharge vibration eliminator, and head pressure control.
 - d. The system shall have a factory mounted and pre-wired control panel complete with main fused disconnect, compressor circuit breakers, contactors, and time clocks wired for single point power connection.
 - e. The supporting frame shall be constructed of structural steel, fully welded, and protected against rust and corrosion with one (1) coat primer, and two (2) coats paint, unless otherwise specified.
 - f. Systems specified for outdoor installation shall be fully protected in a weather-proofed housing with louvered front panel and hinged top, constructed to resist rust and corrosion, and furnished with low ambient controls. Crankcase heater shall be provided with every compressor.
3. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the Board of Fire Underwriters or ASHRAE Standards, whichever is greater.
4. Each refrigeration item specification is written to provide minimum specifications and scope of work. All refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

<u>TYPE</u>	<u>REFRIGERATORS</u>	<u>FREEZERS</u>
a. Walk-In	+35° F./1.7° C.	-10° F./-23.3° C.
b. Reach-In	+35° F./1.7° C.	-10° F./-23.3° C.
c. Undercounter	+35° F./1.7° C.	-10° F./-23.3° C.
d. Fabricated	+35° F./1.7° C.	-10° F./-23.3° C.

- e. Cold Pans +0° F./-17.8° C.
- f. Work Rooms +50° F./10° C.

5. Provide (including payment if subcontracted) all electrical and refrigeration components needed by the completed system and complete (or have completed by the respective trades) all connections of and to said components.
6. An evaporator coil defrost system shall be provided and installed by the K.E.C. on all refrigeration systems designed to operate at an evaporator coil temperature of less than +35° F. Evaporator coil units provided without electric defrost feature shall be installed with a solenoid valve in the liquid line, controlled by the time clock so as to shut off the flow of refrigerant and allow the compressor to pump down and shut off by activation of the pressure control switch.
7. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.
8. Verify and provide manufacturer's certification that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
9. All refrigeration systems shall be installed and wired in strict conformance with the manufacturer's instructions and recommendations.

B. Motors and Heating Elements:

1. Motors up to and including 1/2 HP shall be wired for 120 volt, single phase service. Motors larger than 1/2 HP shall be wired for 208 volt, single or three phase service as indicated. Motors shall be of the drip-proof, splash-proof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. All motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Insulation shall be N.E.M.A. Class B or better.
2. Heating elements having a connected load up to and including 1,000 watts shall be wired for 120 or 208 volt, single phase service, or as indicated on the drawings.
 - a. Any heating element larger than 1,000 watts or any combination of elements in one fixture totaling more than 1,000 watts shall be wired for 208 volt single or three phase service, as indicated on the drawings.
 - b. Fixtures having multiple heating elements may be wired for three phase service with the load balanced as equally as possible within the fixture.

C. Switches and Controls:

1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent graphics, conspicuously labeled, to assist the user of each item.
2. Mount switches and controls directly adjacent the piece of equipment for which it involves, on operator's side of counter body apron, out of view to the public.

3. Provide on or for each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating and in accordance with Underwriter's Code wherever such equipment is not built in. All other line switches, safety cut-outs, control panels, fuse boxes, other control fittings and connections, when not an integral part of the unit or furnished loose by the manufacturer will be furnished and installed by the Electrical Contractor, unless otherwise specified. All electrical controls, switches, or devices provided loose for field installation as a part of the item specified shall be installed in the field by the Contractor unless otherwise specified.
4. Appliances shall be furnished complete with motors, driving mechanisms, starters, and controllers, including master switches, timers, cut-outs, reversing mechanisms, and other electrical equipment if and as applicable.

D. Cover Plates:

1. All controls mounted on vertical surfaces of fixtures shall be set into recessed die stamped stainless steel cups, or mounted onto removable cover plates in such a fashion as to not protrude or interfere with the operation of each item.
2. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches and controls furnished by the K.E.C., and shall match the material and finish of the equipment to which they will be fastened.

E. Wiring and Conduit:

1. Wiring shall be properly protected in N.E.M.A. and U.L. approved metal enclosures. Only rigid steel conduit shall be used, zinc coated where unexposed and chrome plated where exposed. All wiring shall be run concealed wherever possible.
2. All equipment furnished under this contract shall be so wired, wound, or constructed so as to conform with the electrical characteristics at the job site.
3. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment.
4. Furnish all foodservice equipment completely wired internally using wire and conduit suitable for a wet location. Where an Electrician's services are required, the work shall be done in the K.E.C.'s factory or at his expense at the job site at no additional cost to the Owner. Provide all electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a master circuit breaker panel with all wires neatly tagged showing item number, voltage characteristics, and load information. Final connection shall be made by the Electrical Contractor.

F. Cords, Plugs, and Receptacles:

1. The Electrical Contractor shall provide three- or four-wire, grounding-type receptacles for all wall and floor mounted outlets to be used for plug-in equipment with characteristics as noted on the drawings. Provide "Hubbell" three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment, as indicated on drawings and item specifications.
2. K.E.C. shall coordinate with the Electrical Contractor so that the receptacles provided will match the specific plugs provided as part of the plug-in equipment. Any changes in cords and plugs required in the field due to lack of coordination between the Electrical Contractor and the K.E.C. shall be the latter's responsibility.

3. Reduce the length of all cords furnished with the specified equipment to a suitable or appropriate length so they do not interfere with other equipment or operations.
4. Pedestal receptacles that are part of fabricated equipment exposed to view, shall be similar to T&S Model No. B-1508DD single face, single gang or Model No. B-1528DD single face, double gang.

G. Water Inlets:

1. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be placed on the fixture to form a part of same to prevent siphoning. Where exposed to view, piping and fittings shall be chrome-plated.

H. Drain Lines:

1. Plumbing Contractor shall provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes in accordance with Plumbing Rough-In Plans, chrome-plated where exposed. Extend to a point at least 1" (or as required by local codes) above the rim of the floor drain, cut bottom on 45E angle and secure in position.
2. All horizontal piping lines shall be run at the highest possible elevation and not less than 6" above finished floor, through equipment where possible.
3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks of more than one thread at the fitting.
4. All steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
5. Provide suitable pressure regulating valves for all equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions.

I. Faucets, Valves and Fittings:

1. All sinks shall be fitted with chromium plated, swing spout faucets of same manufacturer throughout as follows, or otherwise specified in Item Specifications.
 - a. Prep and Utility Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-231.
 - b.) Fisher Manufacturing Company, Model 3253.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-221.
 - b.) Fisher Manufacturing Company, Model 3313.
 - b. Pot Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-290.
 - b.) Fisher Manufacturing Company, Model 5214.
2. Pre-Rinse Assemblies:

- a. Splash-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-133 with B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2210 with 2902-12 wall bracket.
 - b. Deck-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-143 with B-510 mixing valve and B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2810 with 2805-CV mixing valve and 2902-12 wall bracket.
- 3. Vacuum Breakers:
 - a. General Use:
 - 1.) Fisher Manufacturing Company, Model 3990-8000.
 - b. Disposers:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-455.
 - b.) Fisher Manufacturing Company, Model 3990.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-456.
 - b.) Fisher Manufacturing Company, Model 3991.
- 4. Trough Inlets:
 - a. Fisher Manufacturing Company, Model No. 2905.
- 5. Other specialty faucets, pre-rinse assemblies, vacuum breakers, and trough inlets, as specified under Item Specifications.
- 6. All sink compartments shall be fitted with 2" NPT male, chrome-plated, brass rotary waste valves complete with overflow assemblies and stainless steel strainers.
 - a. Prep and General Utility Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6100.
 - b. Pot Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6102.
- 7. Refer to Division 22 for all other fittings.
- J. Metals and Alloys:
 - 1. Stainless steel sheets shall conform to ASTM 240, Type 302, Condition A, 18-8, of U.S. Standard Gauges as previously indicated under paragraph 2.1.E.
 - a. All exposed surfaces shall have a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view.
 - b. All sheets shall be uniform throughout in color, finish, and appearance.
 - c. Rolled shapes shall be of cold rolled type conforming to ASTM A36.
 - 2. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
 - 3. Where galvanized metal is specified, it shall be copper-bearing galvanized iron, cold-rolled, stretcher leveled, bonderized, re-rolled to insure a smooth surface, and used in the largest

possible sizes with as few joints as necessary.

4. Galvanizing shall be applied to rolled shapes in conformance with ASTM A123, and to sheets in conformance with ASTM A526, coating designation G-90.

K. Castings:

1. Castings shall consist of corrosion resisting metal (white metal) containing not less than 30% nickel. All castings shall be rough ground, polished, and buffed to bright lustre and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.

L. Hardware and Casters:

1. All hardware shall be of heavy-duty type, satin finished chromium plated brass, cast or forged or highlighted stainless steel of uniform design. All hardware shall be a well-known brand, and shall be identified by the manufacturer's name and model number for easy replacement of broken or worn parts.
2. Casters on custom-built equipment shall be heavy-duty type, ball bearing, solid or disc wheel, with grease-proof rubber, neoprene, or polyurethane tire. Wheel shall be 5" diameter, minimum width of tread 1-3/16", minimum capacity per caster 250 pounds, unless otherwise noted.
 - a. Solid material wheels are to be provided with stainless steel rotating wheel guard.
 - b. All casters shall have sealed wheel and swivel bearings, polished plated finish and be N.S.F. approved.
 - c. All equipment specified with casters shall have a minimum of two (2) with brakes installed on opposite corners, unless otherwise noted.

M. Locks:

1. When specified, doors and drawers of all custom fabricated or manufactured equipment shall be provided with cylinder locks, disc tumbler type with stainless steel faceplate as manufactured by Standard-Keil Mfg. Co., or approved equal.
 - a. Provide two (2) sets of keys for each lock.
 - b. All locks shall be keyed alike, except at cashiers stations or unless otherwise specified.

N. Thermometers:

1. All fabricated refrigerated compartments shall be fitted with exterior mounted, adjustable, dial or digital thermometers with flush bezels, and shall be calibrated after installation.

O. Sealants:

1. Sealant, wherever required, shall conform to ASTM C 920; Type S Grade NS, Class 25, Use Nt, with characteristics that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 and N.S.F. RTV-732 for use in areas where it comes in contact with food.
2. Dow-Corning #780 or General Electric "Silastic", or approved equal, in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers recommendations for a smooth, sealed finish.

2.3 FABRICATION AND MANUFACTURE

A. Materials and Workmanship:

1. Unless otherwise specified or shown on drawings, all materials shall be new, of best quality, perfect, and without flaws. Material shall be delivered and maintained on the job in an undamaged condition.
2. Fabrication shall be equal to the standards of manufacture used by all first class equipment manufacturers, performed by qualified, efficient, and skilled mechanics of the trades involved.
3. All items of standard equipment shall be the latest model at time of delivery.
4. All fabricated work shall be the product of one manufacturer of uniform design and finish.
5. Each fabricated item of equipment shall include all necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength.
6. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and all doors and drainboards shall be constructed of a single sheet of metal.
7. Except where required to be removable, all flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate all buckle, warp, rattle, and wobble. All equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unacceptable, and the K.E.C. shall add additional bracing in an approved manner to achieve acceptance.

B. Sanitary Construction:

1. All fabricated equipment shall be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their Bulletin on Food Service Equipment entitled "Standard No. 2" dated October 1952, and in compliance with the local and State Public Health Regulations in which the installation will occur.
2. All fabricated equipment shall bear the N.S.F. "Seal of Approval".

C. Construction Methods:

1. Welding:
 - a. All welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces; free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one-piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
 - b. Spot welds shall have a maximum spacing of 3". Tack welds shall be of at least 1/4" length, and spaced no greater than 4" from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" centers.
 - c. In no case shall soldering be considered as a replacement for welding, nor shall any soldering operation be done where dependence is placed on stability and strength of the joint.

- d. Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building in one piece shall be constructed so that the field joints can be welded at the job site.
- e. All exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has been sunk or depressed by welding operation, depression shall be suitably hammered and peened flush with the adjoining surface and ground to eliminate low spots. In all cases the grain of rough grinding shall be removed by successive fine polishing operations.
- f. All unexposed welded joints on undershelves of tables or counters of stainless steel shall be suitably coated at the factory with an approved metallic-based paint.
- g. After galvanized steel members have been welded, all welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with Military Specification Number MIL-P-26915.

2. Joints:

- a. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require a filler. Wherever break bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, or cracked in appearance; where such breaks do mar the uniform surface appearance of the material, all such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free of burrs, fins, and irregular projections and shall be finished to obviate all danger of laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed edges occur.
- b. Field welded joints shall be ground smooth without dips and irregularities and finished to match original finish.

3. Bolt, Screw and Rivet Construction:

- a. All exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied.
- b. Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel or chrome acorn nut and stainless steel lock washer.
- c. If rivets are used to fasten rear paneling to the body of the fixture, such rivets shall be stainless steel. In no case shall iron rivets be used.

4. Sound Deadening:

- a. Schnee Butyl-Sealant 1/2" wide rope continuously between all frame members and underside of stainless steel table tops, overshelves and undershelves.
- b. Tighten stud bolts for maximum compression of sealant.

5. Hi-Liting:

- a. All horizontal edges of stainless steel tops, splashes, tops of raised rolled rims, and edges of all exposed doors, handles and shelf edges shall be hi-lited, in uniform design by grinding with abrasive not coarser than #240 grit, then polishing with compound to a uniform mirror finish.

6. Polishing:

- a. The grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge.

- b. Where sinks and adjacent drainboards are equipped with backsplash, the grain of the polishing shall be consistent in direction throughout the length of the backsplash and sink compartment

7. Finishes:

- a. Paint and coatings shall be of an N.S.F. approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations, and shall be applied in accordance with the manufacturers recommendations.
- b. All exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, primed with rust inhibiting primer, degreased, and finished with two (2) coats of glossy enamel grey hammertone paint, unless otherwise noted.
- c. Where baked enamel finishes are specified, they shall be oven baked on the fixtures for a minimum of 1-1/2 hours at a minimum temperature of 300° Fahrenheit.
- d. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable after the equipment installation is complete at the job site, and final clean-up has begun.

D. Construction:

1. Legs:

- a. All tubular stands for open base tables, sinks, or dishtables shall have legs constructed of 1-5/8" O.D. stainless steel tubing, with 1-1/4" O.D., #16 gauge stainless steel crossbracing running between legs at a point 10" above finished floor.
- b. All joints between legs and crossbracing shall be welded and ground smooth, full 360°F.
- c. The top end of legs shall be closely fitted into fully-enclosed stainless steel conical gussets no less than 3" high, similar to Klein #481-58 or #483-58, or approved equal.
- d. Gussets shall be fully welded to framing reinforcing members, so that, set screw is not visible from front.
- e. Legs without crossrails will not be accepted.
- f. Legs shall be spaced at not more than 5'-6" on centers, unless otherwise specified.

2. Feet:

- a. All tubular legs will be wedged for appearance and close fit to United Show Case #BF-158, or approved equal, fully enclosed, stainless steel bullet-shaped foot.
 - 1.) The foot shall be threaded into a collar and completely welded inside the tubular leg to permit a maximum adjustment of 2" without any thread exposure.
 - 2.) Threads shall be National Course Series Class 2 fit or better, machined to prevent end play when foot is at maximum adjustment.
 - 3.) The bullet-shaped foot shall have slightly rounded bottom to protect the floor, and a minimum bearing surface of 3/4" diameter of stainless steel-to-floor contact.
 - 4.) Bottom of tubular leg shall be finished off smoothly to provide a sanitary fitting and prevent the accumulation of grease or other debris.
- b. Cabinet type fixtures shall be mounted on 8" high die-stamped, sanitary, two-piece stainless steel legs no less than 2-3/4" in diameter at the top, Component Hardware #A72-0811, or approved equal.
 - 1.) The bottom fully enclosed, stainless steel, bullet-shaped foot threads up into the inside of the upper member, with a male threaded 5/8" bushing to permit maximum adjustment of 2" without thread exposure.

- 2.) The upper section shall be stamped in a neat design with a flared inverted shoulder and fully welded to a base plate designed for anchoring to the channel underbracing.
3. Table Tops:
 - a. Tables shall be constructed of stainless steel, and of a thickness not less than #14 gauge with 1-3/4" by 120° rolled edges, or as otherwise specified and detailed.
 - b. All corners shall be bull-nosed and of the same radius as rolled edges.
 - c. Joints where required shall be butt-welded and ground smooth to present a uniform one-piece appearance.
 - d. All tops shall be reinforced on the underside with a fully welded framework of 1-1/2"x1-1/2"x1/8" galvanized steel angles with the framing extending around the top perimeter and crossbraced on 24" maximum centers.
 - e. 1"x4"x1" galvanized or stainless steel, fully welded, cross channel, closed end members placed at each pair of legs with one (1) channel running lengthwise will also be acceptable.
 - f. All tops shall be reinforced so that there will be no noticeable deflection.
 - g. Metal tops where adjacent to walls or other items of equipment, shall be constructed with integral, coved, back and/or endsplashes as required and specified in accordance with the standard details contained herein. Close all ends of splashes.
4. Enclosed Bases:
 - a. All enclosed bases or cabinet bodies shall be of seamless #18 gauge stainless steel construction, enclosed on the ends and sides as required and called for under each item.
 - b. Ends of body shall terminate at front or operator's side in a 2" wide mullion, vertical, and completely enclosed. All intermediate mullions shall be completely enclosed.
 - c. The bases shall be reinforced at the top with a framework of 1-1/2"x1-1/2"x1/8" galvanized angles, with all corners mitered and welded solid.
 - d. Underside of top shall be reinforced with channels and gussets where necessary. Additional angles and cross members shall be provided to reinforce shelves and support tops under heavy tabletop equipment.
 - e. Where sinks or other drop-in equipment occur, provide additional reinforcing extending crosswise, both sides of opening.
 - f. In the case of fixtures fitting against or between walls, the bodies shall be set in 1" or 2" from the wall line, with the tops continuing to the wall line with integral, coved splashes as specified. Extend vertical face of body to the wall line only. This will permit adjustment to wall irregularities. Vertical trim strips will not be accepted.
 - g. Bodies shall be fitted with counter style stainless steel legs as hereinbefore specified.
5. Drawers:
 - a. Drawers, where specified, shall have removable pan inserts of #18 gauge stainless steel, and shall be approximately 20"x20"x5" deep unless otherwise specified.
 - 1.) Perimeter top edge shall be flanged out 1/2".
 - 2.) All interior horizontal corners shall be rounded on a 1" radius, and all interior vertical corners shall be rounded on a 2" radius.
 - b. Fronts shall be double pan #16 gauge stainless steel construction, 1" thick, insulated with a semi-rigid, fiberglass board, unfaced, having a three-pound density.
 - 1.) The top of the drawer face shall be formed as an integral pull by breaking the front pan back on a 45° angle 1", then straight up 1", back to front 1", and then down at the front 3/4".
 - 2.) Drawer front shall have all edges and corners ground smooth with a radius edge pull.
 - 3.) Provide hard rubber button bumpers attached to rear of drawer face at each corner.

- c. The drawer shall have an all welded frame of 1"x1", #16 gauge stainless steel angles sized to fit the removable pan insert.
- d. Drawers shall operate on #14 gauge full-extension slides with stainless steel roller bearings with hardened and ground raceways, Component Hardware, S52 Series, or approved equal. Slides shall be pitched approximately 3/8" per foot to permit self closing action.
- e. Drawers shall be adequately and neatly fitted to the guides to permit easy operation without rattle or binding.
- f. Slides and frame shall be reinforced to support a dead weight of 150 pounds when drawer is fully extended.
- g. Adjustable stops shall be provided for each drawer at the fully-opened position, and be readily liftable by hand for easy removal of drawer.
- h. All drawers not mounted inside a cabinet body shall be completely enclosed in an #18 gauge stainless steel box-type enclosure and suspended from angle framing under the fixture top. The housing bottom shall be flanged and welded to an #18 gauge stainless steel reinforcing channel extending across the open end.

6. Sliding Doors:

- a. Sliding doors shall be of the double pan type, with the exterior pan constructed of #18 gauge stainless steel with all four sides channeled and corners welded. The interior pan shall be similarly constructed of #20 gauge stainless steel, set into the exterior pan, and welded in place.
- b. All doors shall be insulated with semi-rigid fiberglass board, un-faced, having a three-pound density. Styrofoam shall not be acceptable.
- c. Doors 18" wide or greater, shall have internally welded 4" wide reinforcing channels to prevent warpage.
- d. Each door shall be fitted with a positive flush-type stainless steel pull, Standard-Kiel #1262-1014-1283 recessed handle, or approved equal.
- e. In the back of each door install a 1"x1", #16 gauge stainless steel angle stop welded in a suitable location to prevent the doors from overpassing the flush pulls.
- f. Doors in the closed position shall overlap each other by no more than 2".
- g. Each door shall be fitted with two (2), 1-3/8" ball bearing sheaves fastened to 1"x1/8" stainless steel bar stock welded to the top corners of each door for suspending on an overhead #16 gauge stainless steel channel track. The hangers shall be tapped for 1/4"-20 thumb screw vertical locks which prevent the doors from jumping the track in operation while permitting easy removal for cleaning without tools.
- h. Insure that the bottom of the doors are positively and continuously guided to assure proper alignment and passing regardless of the position of each door.
- i. Provide hard rubber bumpers for doors to close against to insure quiet operation.

7. Hinged Doors:

- a. Hinged doors shall be of the same materials and construction as sliding doors previously specified.
- b. Hinges shall be heavy duty, stainless steel, removable type, and fastened by tapping into 1/4"x3/4" stainless steel bar stock inside the door pan and behind the door jamb.
- c. The door face shall be flush with the cabinet body when fully closed.
- d. Size widths of doors equally when installed in pairs, or in series with other pairs, with no door being greater than 36" in width.
- e. Doors shall be held closed by permanent magnetic closure devices of an approved type and of sufficient strength to hold the doors shut. Install two (2) per door (minimum), mounted to the door jamb, top and bottom, with opposing chrome-plated steel plates securely fastened to the inner panel of the doors.

8. Undershelves:

- a. All open base tables shall be provided with full-length undershelves of #16 gauge stainless steel fully welded to legs with all joints ground smooth and polished.
- b. Front edge shall turn down 1-1/2" and under 1/2".
- c. Turn up rear and ends 2", with integral coved radius, when specified.
- d. If required by width, provide 1-1/2"x1-1/2"x1/8" galvanized angle bracing mounted to underside, full length.

9. Interior Shelves:

- a. All interior shelves within cabinet bodies, enclosed bases and overhead cabinets, shall be of #16 gauge stainless steel.
- b. Removable shelves shall be constructed in equal sections, and rest in 1-1/2"x1-1/2"x1/8" stainless steel angle frame. Cove all horizontal corners in accordance with N.S.F. requirements.
- c. Stationary shelves shall have 2" turn-up on back and ends, and continuously welded to cabinet body, polished and ground smooth to form a one-piece interior free of any crevices.
- d. Front edge shall turn down 1-1/2" and under 1/2", and finished with "z" bar forming completely enclosed edge for maximum strength and sanitation.
- e. Provide 1-1/2"x1-1/2"x1/8" angle bracing mounted to underside, full length.

10. Elevated Shelves:

- a. Shelves over equipment not adjacent to a wall shall be mounted on 1" diameter #16 gauge stainless steel tubular standards neatly fitted with stainless steel base flanges, unless otherwise specified.
- b. The top of the tubular standards shall be completely welded to #14 gauge stainless steel support channels, full width of overself.
- c. Inside the tubular standard, and welded to same, provide 1/2" diameter steel tension rod extended through countertop and securely anchored to lower framework reinforcing with nuts and lock washers in such a manner as to assure a stable, sway-free structure.
- d. If required by width, provide 1-1/2"x1-1/2"x1/8" stainless steel angle bracing mounted to underside, full length.
- e. Cantilevered shelves, when called for, shall be #16 gauge stainless steel supported on #14 gauge stainless steel brackets welded to 1-5/8" O.D. stainless steel tubular standards extending through the backsplash, and fully welded to the table framework. Provide Klein #481-SH welded sleeves where standards penetrate backsplash.

11. Wall Shelves:

- a. Open wall shelves shall be constructed of #16 gauge stainless steel with back and ends turned up 2", positioned 2" out from face of wall, with all corners welded, and supported on #14 gauge stainless steel brackets.
- b. Brackets shall be flanged inward beneath the shelf and at the wall 1-1/2" with intersecting flanges completely welded, and attached to shelf with studs welded to the underside and bolted with stainless steel lock washers and chrome-plated cap nuts.
- c. Each bracket shall be fastened to the wall with a minimum of two (2) 1/4"-20 stainless steel bolts anchored securely by means of toggles or expansion shields.

12. Sinks:

- a. All sinks shall be the size and shape as shown on drawings, and constructed of #14 gauge stainless steel with backs, bottoms and fronts formed of one continuous sheet and the ends welded in place.

- b. Sinks shall have all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
- c. Multiple compartment sinks shall be divided with double wall, #14 gauge stainless steel partitions with a 1/2" radius on top and all corners rounded as other corners, continuously welded, ground smooth and polished.
- d. The bottom of each compartment shall be creased to a die stamped recess, tapered and shaped to receive a lever type waste without the use of solder, rivets, or welding.
- e. Provide #14 gauge stainless steel waste lever angle bracket mounted to underside of compartment at front.
- f. The front and exposed ends of sinks shall be fabricated with a 1-1/2", 180 degree rolled edge. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
- g. Unless otherwise specified, two (2) faucet holes on 8" centers shall be provided, located over the centerline of partitions between compartments, 2-1/2" down from splash break.
- h. Gussets for legs shall be fully welded all around to #12 gauge stainless steel triangular plates fully welded to underside of sink.
- i. Sinks fabricated into working surfaces shall be constructed of the same material and in like manner to sinks specified above, except rolled edge and backsplash shall be omitted and the bowl shall be completely welded integral and flush with the working surface. Where basket type wastes are called for, they shall be fitted with removable seats.
- j. Where sink bowls are exposed, the exterior shall also be polished to a #4 finish.

13. Sink Drainboards:

- a. Drainboards shall be constructed of the same material as the sinks and shall be welded integral to same.
- b. The front portion of drainboards shall continue the 1-1/2", 180° rolled edge of sink bowls on a continuous and level horizontal plane.
- c. The surface of the drainboard shall pitch from 2-1/2" at the end furthest from the sink, to 3" at the bowl; or 1/8" per foot. In addition, the bottom surface shall be dished toward the center for complete drainage.
- d. The backsplash of the drainboard shall match the rear of the sink contour and shall be welded integral thereto, running parallel to the floor.
- e. Drainboards shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise.
- f. Where disposer cones are fabricated into drainboards, additional 1"x4"x1" stainless steel channels shall be welded into the top framing, spanning the drainboard from front-to-back on both sides of the cone and located not more than 3" to either side.
- g. Disposer control panels or switches shall be supported beneath drainboards, when specified, by means of a #12 gauge stainless steel mounting bracket.

14. Dishtable Tops:

- a. Dishtables shall be constructed of #14 gauge stainless steel with all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
- b. Fronts and exposed ends shall be fabricated with a 3" high, 1-1/2", 180° rolled edge with rounded corners. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
- c. All tops shall slope 1/8" per foot (minimum).

- d. Dishtables shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise fully welded between front-to-back channels.
- e. Where tops fit into dishmachines, they shall turn down and into, forming a sealed watertight fit, and attached according to dishmachine manufacturers instructions.
- f. On each side of dishmachine, tables shall be provided with integral splash shields as part of the backsplash.
- g. Silicon filling of gaps caused by poor fit will not be acceptable.
- h. On corner-type door machines, provide #14 gauge stainless steel wall-mounted, splash panel to protect adjacent wall, full width of door opening.

15. Cafeteria Style Counters:

- a. All counters shall be constructed as previously specified under Enclosed Bases.
- b. Provide top and bottom framing for each counter food pan, cold pan, coffee urn, ice cream unit, ice bin, dish dispenser, etc., whether a drop-in unit or a cutout for a portable unit.
- c. Where plate shelves occur, frame horizontally 8-1/2" back from counter edge or as design dictates, and at bottom of shelf at counteredge.
- d. The countertop shall be constructed of #14 gauge stainless steel, as previously specified, with all joints welded, ground and polished.
- e. Fronts and exposed ends shall be stainless steel, plastic laminate or other material as noted in the Item Specifications.
- f. All display glass shelving shall be 1/4" polished plate glass and fully trimmed with #18 gauge stainless steel formed channels. Top shelves shall be the same width as the shelf below. Shelves shall be supported on 5/8" square, #16 gauge stainless steel perimeter tubing fully welded to 1-1/4" square, #16 gauge stainless steel tubing uprights.
- g. Provide appropriate adjustable glass sneeze or breath guards trimmed in stainless steel along front, entire length, mounted in Klein 4465-A brackets.
- h. Protector shelf over hot food wells shall be #16 gauge stainless steel supported on 1-1/4" square, #16 gauge stainless steel tubing uprights, with 1/4" polished plate glass front and end panels trimmed in #18 gauge stainless steel channels. When specified for self-service, mount bottom edge of front panel 8" above countertop.
- i. All display and protector shelves shall be furnished with full-length fluorescent lights wired to on/off switch in counter apron, with lamps and protective shields. Conceal all wiring in tubular uprights.
- j. Refer to Item Specification for changes, as required.
- k. Counter shall be internally wired complete by the K.E.C., and in such a way as to meet the requirements of the Electrical Code of the job location.

2.4 EQUIPMENT

- A. All items listed on the Contract Documents under the heading "Equipment Schedule" shall be furnished in strict accordance with the foregoing specifications and with the following detailed Itemized Specifications.
- B. Manufacturer's names and model numbers are shown establishing quality, size, and finish required, representing the Owner's and Consultant's requirements and basis for bid. Equipment is listed hereinafter with same item numbers as shown on Contract Documents.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before beginning the installation of foodservice equipment, the spaces and existing conditions

shall be examined by the K.E.C. and any deficiencies, discrepancies, or unsatisfactory conditions for proper installation of foodservice equipment shall be reported to the Architect in writing.

1. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.
2. Beginning installation shall constitute acceptance of the area.

3.2 PREPARATION

- A. Foodservice equipment drawings are diagrammatic and intended to show layout, arrangement, mechanical and electrical requirements.
- B. Field verify all measurements at the building prior to fabrication of custom equipment. Coordinate measurements and dimensions with rough-in and space requirements.

3.3 INSTALLATION

- A. The K.E.C. shall coordinate his delivery schedule with the Contractor to ensure adequate openings in the building to receive the equipment.
- B. Equipment shall be un-crated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.
- C. Provide a competent, experienced foreman to supervise installation and final connections with other trades.
- D. Remote Refrigeration Systems:
 1. All refrigeration work where applicable to this contract shall be accomplished in an approved manner, using finest quality fittings, controls, valves, etc.
 2. Refrigeration items shall be started up, tested, adjusted, and turned over to the Owner in first class condition and left running in accordance with the manufacturer's instructions.
 3. Refrigeration lines and hook-ups shall be completed by the K.E.C. with the exception of electric, water, and drain line final connections unless otherwise specified.
 4. All copper tubing shall be refrigerant grade A.C.R. or type "L".
 5. Silver solder and/or Sil-Fos shall be used for all refrigerant piping. Soft solder is not acceptable.
 6. All refrigerant lines in pipe sleeves or conduit shall be effectively caulked at ends to prevent entrance of water or vermin and at penetrations through walls or floors.
 7. All tubing shall be securely anchored with clamps, and suspended lines shall be supported with adjustable hangers at 6'-0" o.c. maximum.
 8. Wrap drain line in freezer compartment(s) with approved heat-tape for final connection by Electrical Contractor.
- E. Sealing and Caulking:

1. Prior to the application of sealant, all surfaces shall be thoroughly cleaned and de-greased.
2. Apply around each unit of permanent installation at all intersections with walls, floors, curbs or other permanent items of equipment.
3. Joints shall be air-tight, water-tight, vermin-proof, and sanitary for cleaning purposes.
4. In general, joints shall be not less than 1/8" wide, with backer rod to shape sealant bead properly at 1/4" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
5. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" radius.
6. Provide sealant-filled joints up to 3/4" in joint width. Trim strips for wider joints shall be set in a bed of sealant and attached with stainless steel fasteners, 48" o.c., or less, to insure suitable fastening and prevent buckling of the metals fastened.

F. Cutting:

1. All cutting, fitting, or patching required during installation shall be accomplished by the K.E.C., at his own expense, so as to make the work conform to the plans and specifications.
2. The K.E.C. shall not cut or otherwise alter, except with the consent of the Owner, the work of any other Contractor.
3. Provide cut-outs in foodservice equipment where required to run plumbing, electric, or steam lines through equipment items for final connections.

3.4 FIELD QUALITY CONTROL

A. Inspection:

1. Provide access to shop fabrication areas during normal working hours to facilitate inspection of the equipment, during construction, by the Architect or his authorized representative.
2. Errors found during these inspections shall be corrected to the extent required within the scope of the plans, specifications, and approved drawings.

B. Start-Up and Testing:

1. Delay start-up of foodservice equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
2. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.
3. Supply a trained person or persons who shall start up all equipment, test and make adjustments as necessary, resulting in each item of equipment, including controls and safety devices, performing in accordance with the manufacturer's specifications.
4. All gas-fired equipment shall be checked by the local gas company as to calibration, air adjustments, etc., and adjustments made as required.

5. Repair or replace any equipment found to be defective in its operation, including items which are below capacity or operating with excessive noise or vibration.

C. Demonstration:

1. Provide an operating demonstration of all equipment at a time of Owner's convenience, to be held in the presence of authorized representatives of the Architect and Owner.
2. Provide a follow-up kitchen demonstration three (3) months after the initial demonstration or kitchen opening. K.E.C. to coordinate scheduling with manufacturer's representatives.
3. Demonstration shall be performed by manufacturer's representative knowledgeable in all aspects of his equipment.
4. During the demonstration, instruct the Owner's operating personnel in the proper operation and maintenance of the equipment.
5. Furnish complete, bound, operation/maintenance manuals and certificates of warranty for all items of equipment provided, in accordance with Article 1.5 Submittals, Paragraph F, at this demonstration time.

3.5 ADJUST AND CLEAN

- A. Upon completion of installation and tests, clean and sanitize foodservice equipment, and leave in condition ready for use in food service.
- B. Remove all protective coverings, and thoroughly clean equipment both internally and externally with stainless steel cleaner.
- C. Make and check final adjustments required for proper operation of the equipment.
- D. Restore finishes marred during installation to remove abrasions, dents, and other damages. Polish stainless steel surfaces, and touch-up painted surfaces with original paint.
- E. Clean up all refuse, rubbish, scrap materials, and debris caused by the work of this Section, and put the site in a neat, orderly, and broom-clean condition.

3.6 ITEMIZED EQUIPMENT

ITEM #1: UTILITY CART, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Lakeside Manufacturing Company
MODEL NO.: 543 (N058)
PERTINENT DATA: 700-Lb. Capacity, Two-Shelf, N.S.F. Model
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Piper Products; Steril-Sil

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. All four (4) casters swivel-type.

ITEM #2: DUNNAGE RACK

QUANTITY: Two (2)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: With Wire Mat, Metroseal 3™ Epoxy-Coated
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

Dry Storage:

1. Two (2) #HP55K3 Metroseal 3™ epoxy-coated units; 24" W x 48" L.

ITEM #3: SHELVING

QUANTITY: Nine (9)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: MetroMax Q (N058)
PERTINENT DATA: Free-Standing, Polymer Mats, Epoxy Coated Frames & Posts
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

Dry Storage:

1. Two (2) #MQ2442G sections; 24" W x 42" L x 5-tier high.
2. Six (6) #MQ2448G sections; 24" W x 48" L x 5-tier high.
3. One (1) #MQ2454G section; 24" W x 54" L x 5-tier high.
4. Thirty-six (36) #MQ74PE polymer posts, 74-3/16" high.
5. Plastic wedge lock connectors, quantity as required.
6. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

ITEM #4: CAN RACK

QUANTITY: One (1)
MANUFACTURER: Channel Manufacturing, Inc.
MODEL NO.: CSR-156 (N058)
PERTINENT DATA: First-In/First Out, All Welded Aluminum Construction, (156) #10 Can Capacity
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Win-Holt

Furnish and set-in-place per Equipment Plan, Sheet K-101 and Manufacturer's Instructions.

ITEM #5: REACH-IN REFRIGERATOR, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Traulsen & Co., Inc.
MODEL NO.: RHT232WUT-HHS (N058)
PERTINENT DATA: Two-Section, Self-Contained, Stainless Steel Exterior/Interior
UTILITIES REQ'D: 8.2A, 120V, 1PH
ALTERNATE MFR.: Delfield, Continental

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Half-height doors hinged per Equipment Plan.
2. Cylinder locks, master-keyed.
3. Three (3) chrome-plated adjustable wire shelves per compartment, twelve (12) total, each unit.
4. Exterior mounted digital thermometer.
5. 5" diameter heavy-duty swivel casters, front two (2) with brakes.
6. Cord and plug set.

ITEM #6: REACH-IN FREEZER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Traulsen & Co., Inc.
MODEL NO.: RLT132WUT-HHS (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Exterior/Interior
UTILITIES REQ'D: 9.4A, 120V, 1PH
ALTERNATE MFR.: Delfield, Continental

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Half-height doors hinged per Equipment Plan.
2. Cylinder locks, master-keyed.
3. Three (3) chrome-plated adjustable wire shelves per compartment, six (6) total.

ITEM #6: (Continued)

4. Exterior mounted digital thermometer.
5. 5" diameter heavy-duty swivel casters, front two (2) with brakes.
6. Cord and plug set.

ITEM #7: WORKTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 7'-0" Long x 3'-0" Wide x 3'-0" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-105 and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07.
4. Stainless steel undershelf per Detail 1.11.
5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
6. Worktable per Detail 2.01.
7. Sound-deaden underside of tabletop with NSF-approved sound dampening material.
8. Two (2) 20A, 120V receptacles with stainless steel coverplate mounted on each end. Pre-wire to junction box mounted below undershelf and conceal wiring within tubular legs with flanged feet anchored to floor.
9. Accessories:
 - One (1) Edlund #S-11C manual can opener.

ITEM #8: PAN RACK CART, MOBILE

QUANTITY: One (1)
MANUFACTURER: CresCor
MODEL NO.: 207-1820 (N058)
PERTINENT DATA: Fixed Angles, (20) 18x26 Pan Capacity
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Lakeside, InterMetro

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Full-perimeter wrap-around non-marking vinyl bumper.

ITEM #9: PREP SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO: #14 GA Stainless Steel
PERTINENT DATA: 8'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, (2) 1-1/2" IW
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-105; and the following:

1. Front and end edge rolls per Detail 1.02B.
2. 13" high backsplash per Detail 1.04A with finished back.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Stainless steel undershelf on both ends per Detail 1.11.
6. Full length table-mounted stainless steel overshelf per Detail 1.12.
7. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
8. Accessories:
 - One (1) T&S #B-0231 backsplash-mounted swing spout faucet with #B-0199-01F-10 aerator.
 - Two (2) T&S #B-3950-01-SB twist waste valves with overflow assemblies and #010387-45 basket strainers.

ITEM #9: (Continued)

9. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades. Post sign on wall above sink tubs in English and Spanish stating: WARNING! NOT TO BE USED BY CONSTRUCTION TRADES. FAILURE TO COMPLY WILL RESULT IN \$500.00 FINE AND ALL COSTS TO REPLACE ITEM WITH NEW.

ITEM #10: EXHAUST CANOPY

QUANTITY: One (1)
MANUFACTURER: Captive-Aire Systems, Inc.
MODEL NO.: 6630-VHB-G-REM1-PSP-F (N058)
PERTINENT DATA: Stainless Steel, Non-Grease, Heat/Vapor Removal Only Type, Perforated Supply Plenum Make-Up Air
UTILITIES REQ'D: 1,275 CFM Exhaust; 1,020 CFM Supply; 350W, 120V, 1PH (Lights); 3/4" IW
ALTERNATE MFRS.: Gaylord; Avtec; Caddy

Furnish and install per Equipment Plan, Sheet K-101; Condensate Canopy Detail Drawing, Sheet K-106; Manufacturer's Shop Drawing and the following:

1. 8'-6" long x 5'-6" wide x 2'-6" high, with bottom edge mounted at 6'-8" A.F.F. Length comprised of one (1) 8'-6" long section. Entire unit constructed of 18 GA stainless steel type 304 with liquid tight all welded external continuous seams and joints.
2. Three (3) U.L. Listed, NSF-Approved, 12" x 12" recessed LED light fixtures, equally spaced. Bulbs furnished and installed by K.E.C.
3. On/Off fan and light switches furnished and installed by Electrical Contractor.
4. Matching stainless steel perimeter closure panels to finished ceiling by K.E.C.; verify ceiling height.
5. Hanger rods and support system from structure above by other contract. K.E.C. to coordinate method and location with other trades.
6. Integral stainless steel hanger brackets.
7. Full-length, perforated stainless steel front-mounted make-up air plenum with integral supply air balancing dampers.
8. 1" wide full-perimeter integral gutter with 3/4" turn-up and 3/4" stainless steel drain connection.
9. Accessories:
 - #18 gauge stainless steel wall flashing full back and partial left of hood to extend from top of finish floor coved base up to bottom edge of hood body. Attach to wall with non-exposed fasteners and seal with clear silicone sealant.
 - Field wrapper.

ITEM #11: FRUIT SECTIONIZER

QUANTITY: One (1)
MANUFACTURER: Sunkist
MODEL NO.: S-105
PERTINENT DATA: 3-in-1, 2 Halves Scored in 3 Wedges Ea., NSF Listed
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
 - 6 slice Blade cup, w/cover, fits S-10 (S-4B)
 - Plunger slicer, fits part S-04, 6 wedge blade cup (S-10)
 - 8 wedge blade cup (S-29B)
 - Apple Plunger, fits S-32 (S-33, S-32)
 - Apple corer cup, fits S-33 (S-32B)
 - Plastic production stand (S-31)

ITEM #12: WORKTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 8'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-105 and the following:

1. Perimeter edge rolls per Detail 1.02M.
2. Framework per Detail 1.05, to interlock with Item #9, Prep Sink.
3. Legs per Detail 1.07.
4. Full-length stainless steel undershelf per Detail 1.11.
5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
6. Worktable per Detail 2.01.
7. Sound-deaden underside of worktable with NSF-approved sound dampening material.
8. Two (2) 20A, 120V receptacles with stainless steel coverplate mounted on each end. Pre-wire to junction box mounted below undershelf and conceal wiring within tubular legs with flanged feet anchored to floor.

ITEM #13: BLENDER

QUANTITY: One (1)
MANUFACTURER: Robot Coupe
MODEL NO.: Blixer® 3 (N058)
PERTINENT DATA: Single Speed, With Stainless Steel 3.5 Qt. Bowl and Twin Blade Assembly
UTILITIES REQ'D: 1.5HP, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Cord and plug set.

ITEM #14: FOOD PROCESSOR

QUANTITY: One (1)
MANUFACTURER: Robot Coupe USA, Inc.
MODEL NO.: R-602VV (N058)
PERTINENT DATA: Continuous Feed Hopper, Dual Purpose, Variable Speed, 7-Qt. Bowl
UTILITIES REQ'D: 20A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Standard food processor package consisting of: food processor, 7-qt. stainless steel bowl, continuous feed vegetable preparation attachment, (1) #28058 1/8" grating disc and (1) #28064 1/8" slicing disc.
2. Accessories:
 - One (1) #R255 disc rack.
3. Cord and plug set.

ITEM #15: COMBI OVEN

QUANTITY: One (1)
MANUFACTURER: Rational Cooking Systems, Inc.
MODEL NO.: SCC WE 102 E (N058)
PERTINENT DATA: Single Compartment, Full Size, Self-Contained
UTILITIES REQ'D: 37KW, 480V, 3PH; 3/4" CW, 2" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Accessories:
 - One (1) Model #60.30.331, UG II stand with support rails, top and both side panels.
 - Ten (10) #6019.1150 stainless steel 12" x 20" fry baskets.

ITEM #15: (Continued)

- Five (5) #6010.2101 stainless steel 24" x 20" wire racks.
- Rational Certified Installation.
- Chef Assistance Program.
- One (1) Dormont #W75B2Q48 3/4" diameter x 48" long flexible water connectors with quick-disconnect.
- One (1) OptiPure #QTI1+CR dual QT water filtration system to service Item #15, Combi-Oven and Item #16, Convection Steamer.

2. Cord and plug set.

ITEM #16: CONVECTION STEAMER

QUANTITY: One (1)
MANUFACTURER: AccuTemp Products, Inc.
MODEL NO.: E64803E140 DBL (N058)
PERTINENT DATA: (2) Double Stacked 6-Pan, Stand-Mounted Connected Boilerless, Evolution Series
UTILITIES REQ'D: (2) 14.0KW, 480V, 3PH; (2) 3/4" HW, (2) 3/4" IW
ALTERNATE MFRS.: Cleveland

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
 - #SNH-20-01 heavy-duty stainless steel support stand with adjustable bullet feet.
 - One (1) Dormont #W75B2Q48 3/4" diameter x 48" long flexible water connectors with quick-disconnect.
2. Cord and plug set.

ITEM #17: HAND SINK

QUANTITY: Three (3)
MANUFACTURER: Eagle Foodservice Equipment
MODEL NO.: HSA-10-FAW-LRS (N058)
PERTINENT DATA: Wall Mounted, Wrist Handle Faucet
UTILITIES REQ'D: 1/2" CW, 1/2" HW, 1-1/2" W
ALTERNATE MFRS.: Advance/Tabco

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Complete sink assembly including faucet, P-trap, tailpiece, strainer and wall mounting bracket.
2. Accessories: (each unit)
 - #606215 stainless steel skirt assembly.
 - Left and right end splashes.
 - 0.5 gpm low-flow aerator.

ITEM #18: SOAP & TOWEL DISPENSER -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY: Three (3)

ITEM #19: PASS-THRU REFRIGERATOR, MOBILE

QUANTITY: One (1)
MANUFACTURER: Traulsen & Company, Inc.
MODEL NO.: RHT232WPUT-FHG/FHS (N058)
PERTINENT DATA: Two-Section, Self-Contained, Stainless Steel Exterior/Interior
UTILITIES REQ'D: 11.0A, 120V, 1PH
ALTERNATE MFRS.: Delfield, Continental

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Full-height doors hinged per Equipment Plan. Glass doors on kitchen side, solid doors on serving side.
2. Cylinder door locks, keyed-alike.
3. No. 1 - #16 gauge stainless steel, angle type, bottom support tray slides in lieu of wire shelves installed on 3" centers, nine (9) pair per compartment, thirty-six (36) total.
4. Exterior mounted digital thermometer installed on kitchen side.
5. Four (4) heavy-duty swivel casters, all four (4) with brakes.
6. Plastic laminate finish factory applied to exterior door fronts on serving side only; color as selected by Architect; K.E.C. to verify.
7. Cord and twist-lock type plug set with matching receptacle furnished and installed by Electrical Contractor.

ITEM #20: PASS-THRU HEATED CABINET, MOBILE

QUANTITY: One (1)
MANUFACTURER: Traulsen & Company, Inc.
MODEL NO.: RHF132WP-FHG/FHS (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Exterior/Interior
UTILITIES REQ'D: 7.8A, 120/208V, 1PH
ALTERNATE MFRS.: Delfield, Continental

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Full-height doors hinged per Equipment Plan. Glass doors on kitchen side, solid doors on serving side.
2. Cylinder door locks, keyed-alike.

ITEM #20: (Continued)

3. Universal tray slide assembly installed on 5" centers in lieu of wire shelves, five (5) pair per compartment, ten (10) pair total.
4. Exterior mounted digital thermometer installed on kitchen side.
5. Four (4) heavy-duty swivel casters, all four (4) with brakes.
6. Plastic laminate finish factory applied to exterior door fronts on serving side only; color as selected by Architect; K.E.C. to verify.
7. Cord and twist-lock type plug set with matching receptacle furnished and installed by Electrical Contractor.

ITEM #21: MILK COOLER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Beverage-Air
MODEL NO.: STF49Y-1-S (N058)
PERTINENT DATA: 49" Wide, Dual Access, 12-Case Capacity, Forced-Air Type
UTILITIES REQ'D: 3.3A, 120V, 1PH
ALTERNATE MFRS.: Continental; True

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Stainless steel exterior and interior.
2. Cord and plug set.
3. Cylinder lid lock.
4. Swivel casters with brakes.
5. Accessories:
-- #00C01-012A-01 corner bumper kit.

ITEM #22: SERVING COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleyglas by The Delfield Company
MODEL NO.: Modular Fiberglass Interlocking Sections (N058)
PERTINENT DATA: Straight Line Configuration, #14 Gauge S/S Tops
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Colorpoint by Low Temp Industries, Inc.

Refer to individual counter components listed under alpha headings for specification.

ITEM #22A: HOT FOOD COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleyglas by The Delfield Company
MODEL NO.: KH-5-NU (N058)
PERTINENT DATA: Electrically Heated, Open Base, Five (5) Wells, With Drains
UTILITIES REQ'D: 40.0A, 120/208V, 1PH; 1/2" HW, 3/4" IW
ALTERNATE MFRS.: ColorPoint by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide full-length solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. (E) – 6" wide, full-length solid stainless steel fold-down work shelf on server's side.
3. (G) - Sloped front food protector with tempered glass front and fixed end panels.
4. (M) - Radiant heat lamp with incandescent lights and on/off switch.
5. (F) - Line-up interlocks for counter body and tray slide.
6. Cord and plug set. Double cord hooks on bottom of unit.
7. (V) – 6" high stainless steel legs with adjustable bullet feet.
8. (P) - Open understorage with bottom stainless steel shelf.
9. (QQ) – Food wells with individual drains and quarter-turn ball valves manifolded to common valve assembly with master shut-off valve housed within counter base on end opposite Item #22B with stainless steel hinged access door per Detail Sheet K-103.
10. Standard counter height of 36" A.F.F. Turn both end down to align and interlock with adjacent solid top counter.
11. Exterior body color as selected by Architect; K.E.C. to verify.
12. Accessories:
 - T&S #B-0205LN deck-mounted single pantry fill faucet with #B-0208 swivel nozzle mounted on end opposite solid top counter.

ITEM #22B: SOLID TOP COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleyglas by The Delfield Company
MODEL NO.: KC-28-NU-MOD (N058)
PERTINENT DATA: 28" Long, Open Base
UTILITIES REQ'D: 120V, 1PH (Convenience Receptacle)
ALTERNATE MFRS.: ColorPoint by Low-Temp Industries

ITEM #22B: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide full-length solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. (F) - Line-up interlocks for counter body and tray slide.
3. (P) - Open understorage with bottom and intermediate stainless steel shelf.
4. Modified counter height of 30" A.F.F.
5. (V) – 6" high stainless steel legs with adjustable bullet feet.
6. Exterior body color as selected by Architect; K.E.C. to verify

ITEM #22C: FROST TOP COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleyglas by The Delfield Company
MODEL NO.: KCFT-60-B-MOD (N058)
PERTINENT DATA: Mechanically Refrigerated Frost Top, Open Base
UTILITIES REQ'D: 8.0A, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.: ColorPoint by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide full-length solid stainless-steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. (KS) – Single-service flip-up sneeze guard with glass front and ends for self-service.
3. (L) – LED light fixtures.
4. (F) - Line-up interlocks for counter body and tray slide.
5. Cord and plug set. Double cord hooks on bottom of unit.
6. (P) - Open understorage with bottom stainless steel shelf.
7. (V) – 6" high stainless steel legs with adjustable bullet feet.
8. Modified counter height of 30" A.F.F.
9. Remove drain valve. Plumber to sweat copper pipe connection to nearest floor sink.
10. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #22D: CASHIER STAND

QUANTITY: One (1)
MANUFACTURER: Shelleyglas by The Delfield Company
MODEL NO.: KCS-50-MOD (N058)
PERTINENT DATA: 50" Long x 30" Wide
UTILITIES REQ'D: 15A, 120V, 1PH (Dedicated Service)
ALTERNATE MFRS.: ColorPoint by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide full-length solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. (F) - Line-up interlocks for counter body and tray slide.
3. (Q) – One (1) duplex receptacle mounted in counter base. Provide die-raised opening in top for power cord access.
4. (V) – 6" high stainless steel legs with adjustable bullet feet.
5. Utility drawer assembly with locking provision mounted on end.
6. Cord and plug set. Double cord hooks on bottom of unit.
7. Standard counter working height of 36" A.F.F. Turn end down to align and interlock with adjacent Frost Top Counter.
8. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #23: CASH REGISTER -- (N.I.C. - FURNISHED BY OWNER)

QUANTITY: One (1)

ITEM #24: ICE CREAM CABINET, MOBILE -- (N.I.C. - FURNISHED BY VENDOR)

QUANTITY: One (1)

ITEM #25: POT WASHING SINK/SOILED DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: L-Shaped: 10'-5"± x 7'-5"± Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, 1-1/2" IW
ALTERNATE MFRS.: None

ITEM #25: (Continued)

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-105 and the following:

Pot Washing Sink:

1. Front and right end edge rolls per Detail 1.02B.
2. 13" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Stainless steel undershelf on right end per Detail 1.11.
7. 8'-0" long table-mounted stainless steel overshelf per Detail 1.12.
8. Pot sink and drainboards per Detail 3.01.
9. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
10. Accessories:
 - Two (2) T&S #B-290 backsplash mounted swing spout faucets.
 - Three (3) T&S #B-3950-01 twist handle drains with rear-connected over-flows, handle bracket and basket strainer.
11. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades. Post sign on wall above sink tubs in English and Spanish stating: **WARNING! NOT TO BE USED BY CONSTRUCTION TRADES. FAILURE TO COMPLY WILL RESULT IN \$500.00 FINE AND ALL COSTS TO REPLACE ITEM WITH NEW.**

Soiled Dishtable:

1. Front edge roll per Detail 1.02B.
2. 13" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Soiled dishtable per Detail 2.02.

ITEM #25: (Continued)

7. 20" wide x 8" deep integral pre-rinse sink with one-piece removable #20 gauge perforated stainless steel scrap basket with 1" diameter fully welded tubular cross-rails set flush with tabletop. Raise deck at rear of sink 6" for deck-mounted pre-rinse spray and extend to opening of dishmachine to act as rack guide.
8. Provide stainless steel crossrails under pass-thru window for storage of 20" x 20" dish/glass racks.
9. Sound-deaden underside of sink and drainboard with NSF-approved sound dampening material.
10. Accessories:
 - One (1) T&S #B-0113-BJ deck-mounted pre-rinse spray with #B-0109-01 wall bracket.
 - One (1) Component Hardware #D63-4161 box patten drain assembly.

ITEM #26: ROLL-DOWN DOOR -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY: One (1)

ITEM #27: DISHMACHINE

QUANTITY: One (1)
MANUFACTURER: Hobart Corporation
MODEL NO: AM-15T+BUILDUP(N058)
PERTINENT DATA: Fully-Automatic, High-Temp, Door-Type, With Built-in Booster Heater (70°F Rise),
Corner Application, Tall Chamber
UTILITIES REQ'D: 23.7A, 480V, 3PH; 10.0A, 120V, 1PH; 3/4"HW (140°F.), 1/2"CW (Drain Water
Cooling Kit), 1-1/2" IW
ALTERNATE MFRS.: Champion

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Factory installed vacuum breaker.
2. Soap dispensing system and rinse additive system by chemical vendor.
3. Stainless steel feet, frame, legs and front panel.
4. Electric tank heat.
5. Corner installation.
6. Vent fan control.
7. Accessories:
 - Two (2) #DISHRAK-PEG20 peg-type dish racks.
 - Two (2) #DISHRAK-COM20 combination-type dish racks.
 - Two (2) #RACK-6PAN open-end 20"x20" racks for 18"x26" sheet pans.
 - One (1) 3/4" brass pressure regulator.

ITEM #27: (Continued)

- One (1) #DWT-AM15 drain water tempering.
- One (1) built-in booster heater.
- One (1) #WTRHAM-ARREST water hammer arrestor kit with brass pressure regulator valve.
- One (1) #SPLASH_PNL15T corner installation splash panel kit.
- One (1) #SPEC-KIT single-point electrical connection.

ITEM #28: CONDENSATE CANOPY

QUANTITY: One (1)
MANUFACTURER: Captive-Aire Systems, Inc.
MODEL NO: 4230VHB-G-ND (N058)
PERTINENT DATA: Stainless Steel, Exhaust Only Canopy
UTILITIES REQ'D: 525 CFM; 3/4" IW
ALTERNATE MFRS.: Avtec; Gaylord; Caddy

Fabricate and install per Equipment Plan, Sheet K-101; Canopy Details, Sheet K-106; and the following:

1. 3'-6" wide x 3'-6" long x 2'-6" high with bottom edge mounted at 6'-8" A.F.F. Entire unit constructed of 18 GA type 304 stainless steel with #4 finish on all exposed surfaces.
2. 2" wide full perimeter integral gutter with 1/2" turn-up and 3/4" stainless steel drain connection.
3. Integral stainless steel rod hanger brackets, each corner.
4. Stainless steel duct tap collar with removable aluminum mesh filter.
5. Stainless steel perimeter closure panels to finished ceiling by K.E.C.; verify ceiling height.
6. Accessories:
 - #18 gauge stainless steel wall flashing on both walls, full length of hood to extend from top of finish floor coved base up to bottom edge of hood body. Attach to wall with non-exposed fasteners and seal with clear silicone sealant.
 - Field wrapper.

ITEM #29: CLEAN DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 9'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-105; and the following:

1. Front and left end edge roll per Detail 1.02B.

ITEM #29: (Continued)

2. 13" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Stainless steel undershelf per Detail 1.11.
6. Dishtable per Detail 2.02.
7. Sound-deaden underside of tabletop with NSF-approved sound-dampening material.

ITEM #30: POT & PAN SHELVING, MOBILE

QUANTITY: Two (2)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: MetroMax i (N058)
PERTINENT DATA: Four-Tier High, Open-Grid Shelf Mat, Polymer
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Two (2) #MX2448G sections; 24" W x 48" L x 4-tier high.
2. Eight (8) #MX63UP polymer posts, 63" high.
3. Four (4) #5MPX polyurethane swivel casters with bumpers.
4. Four (4) #5MPBX polyurethane swivel casters with brakes and bumpers.
5. Plastic wedge lock connectors, quantity as required.
6. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.
7. Accessories: (For each unit)
 - One (1) #MTR2448XE tray drying rack.
 - Five (5) #MXD24-8 shelf dividers.

ITEM #31: WASHER/DRYER, STACKED -- (N.I.K.E.C. -- SPECIFIED BY ARCHITECT)

QUANTITY: One (1)

ITEM #32: MOP SINK & RACK -- (N.I.K.E.C. – SPECIFIED BY MECHANICAL DIVISION)

QUANTITY: One (1)

ITEM #33: SHELVING

QUANTITY: One (1)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: Four-Tier High, Stationary, Chrome-Plated, Wire
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

Soap Storage:

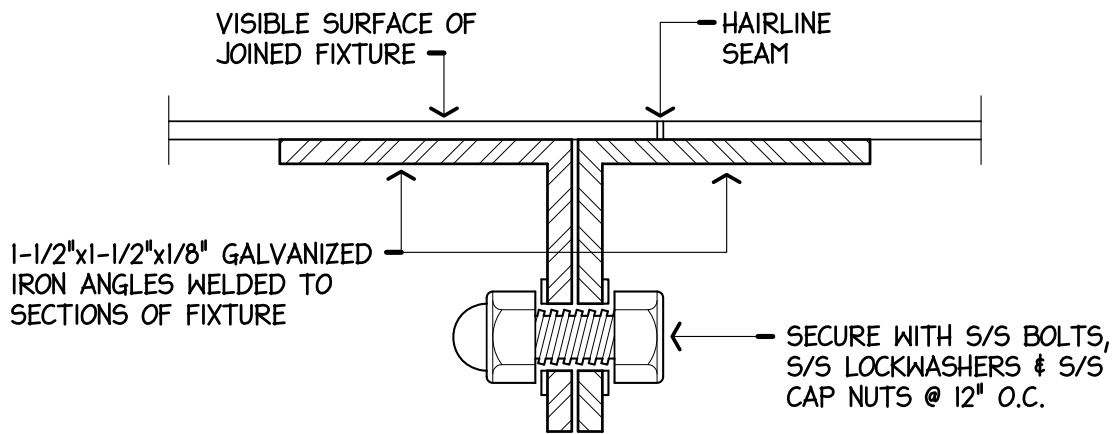
1. One (1) #1442NC section; 14" W x 42" L x 4-tier high.
2. Four (4) #63P chrome-plated posts; 62-7/16" high.
3. Plastic split sleeves, quantity as required.
4. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

ITEM #34: FLY FAN -- (N.I.K.E.C. – SPECIFIED BY MECHANICAL DIVISION)

QUANTITY: One (1)

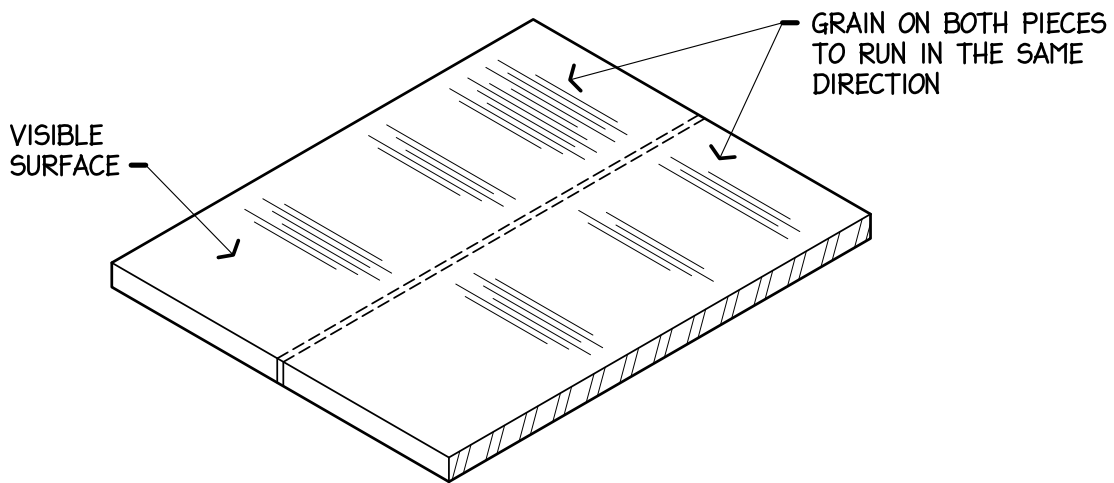
(END OF FOODSERVICE ITEMIZED SPECIFICATIONS)

STANDARD DETAILS



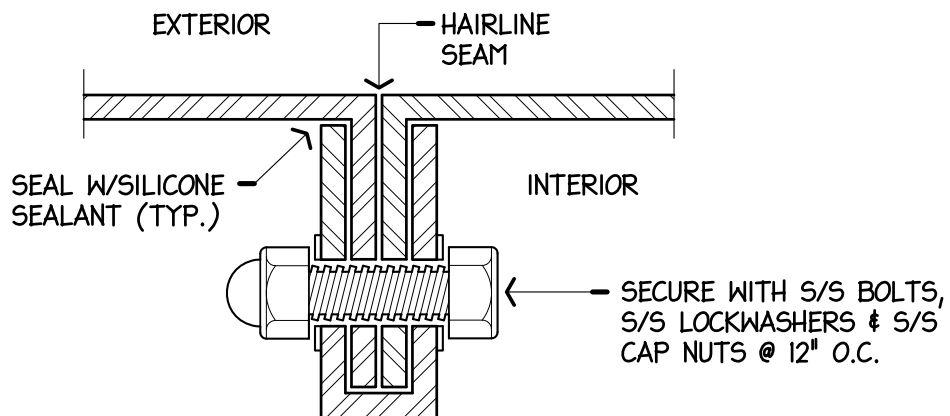
NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

A. BOLT DRAWN JOINT



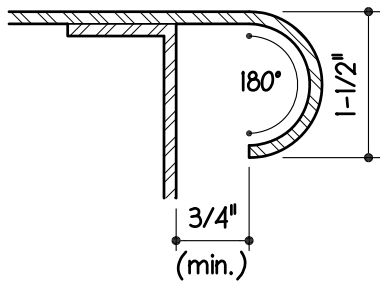
NOTE! ON FIXTURES SPECIFIED WITH WELDED FIELD JOINTS, WELDS SHALL BE CONTINUOUS, GROUND & POLISHED LEAVING NO VISIBLE EVIDENCE OF WELD.

B. WELDED BUTT JOINT

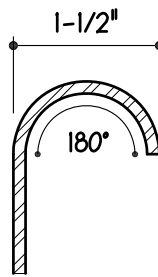


NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

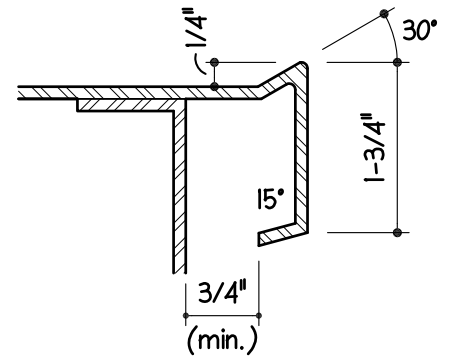
C. RAISED CAP SEAM - KNUCKLE JOINT



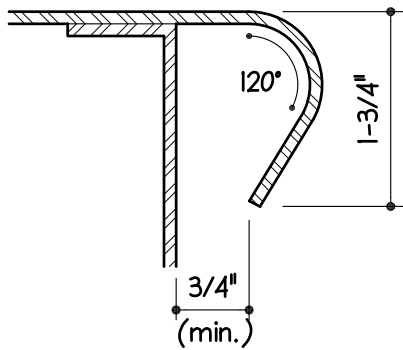
ROLLED A.



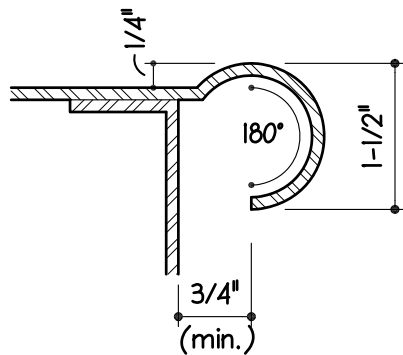
RAISED ROLLED B.



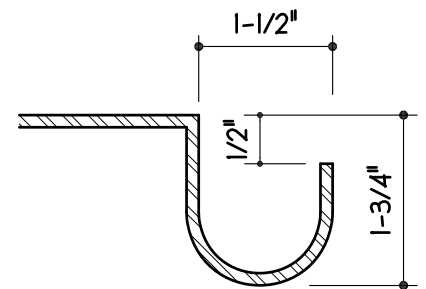
INVERTED "V" EDGE C.



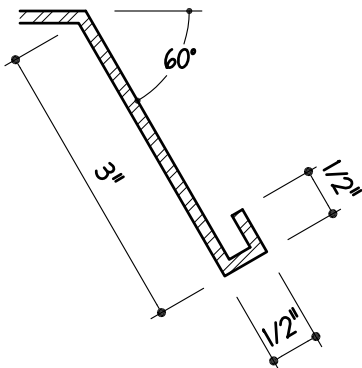
BULL NOSE ROLLED D.



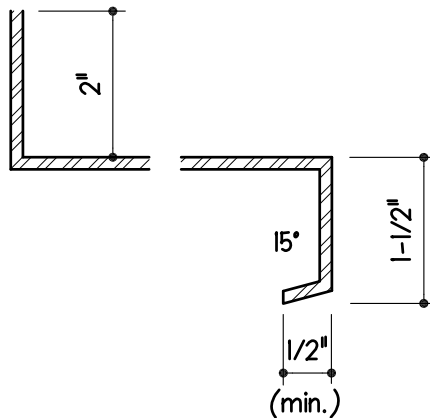
MARINE EDGE E.



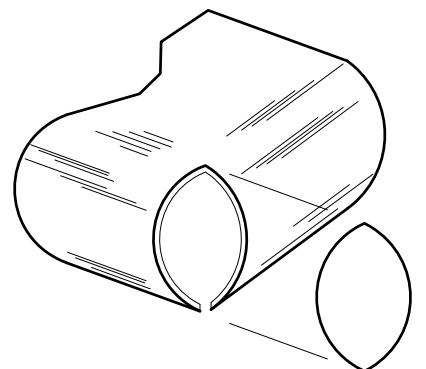
FLOUR GUTTER F.



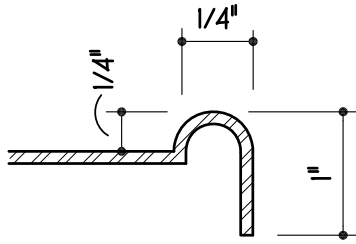
RECIPE CARD HOLDER G.



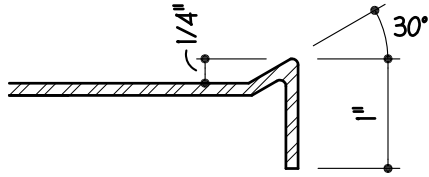
UNDERSHELF EDGE H.



BULL NOSE CORNER I.

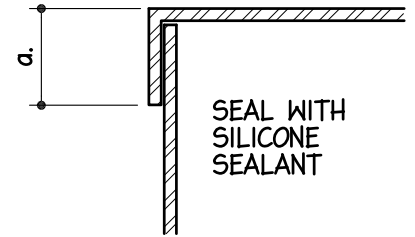


RAISED OPENING EDGE J.

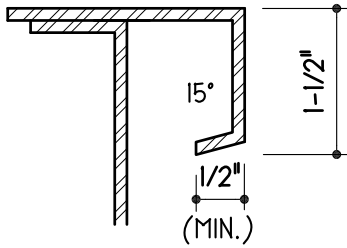


RAISED OPENING EDGE K.

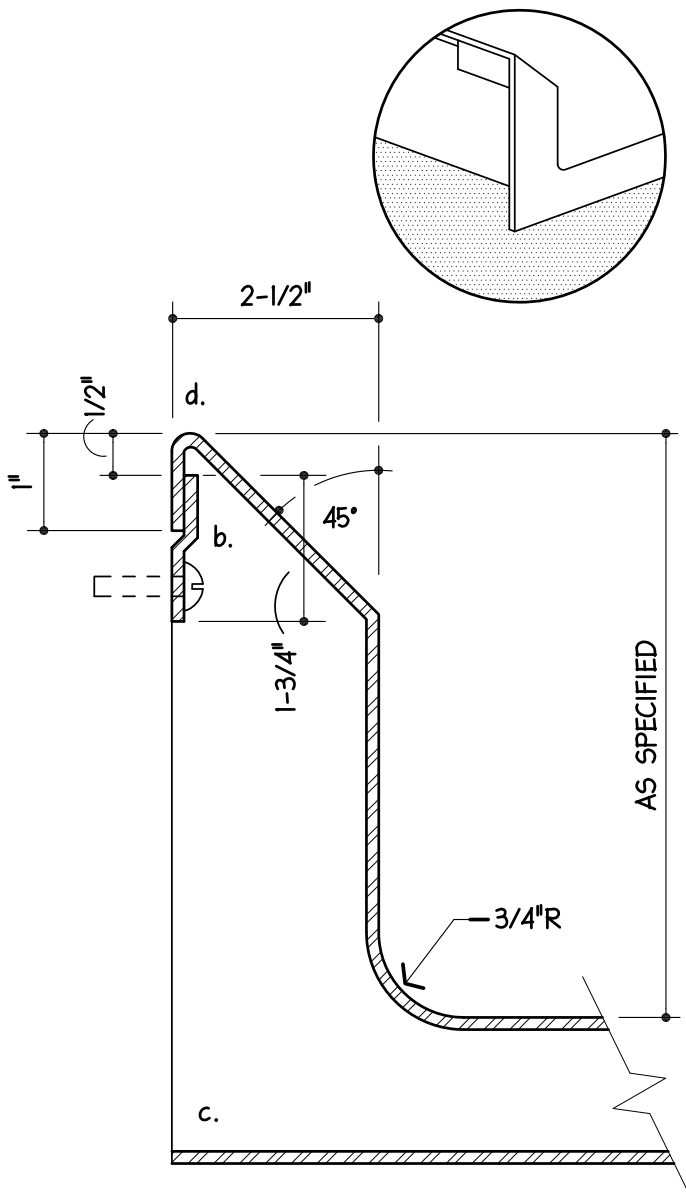
a. AS SPECIFIED. TO
MATCH ADJACENT
ROLLED EDGES



STRAIGHT TURN DOWN L.



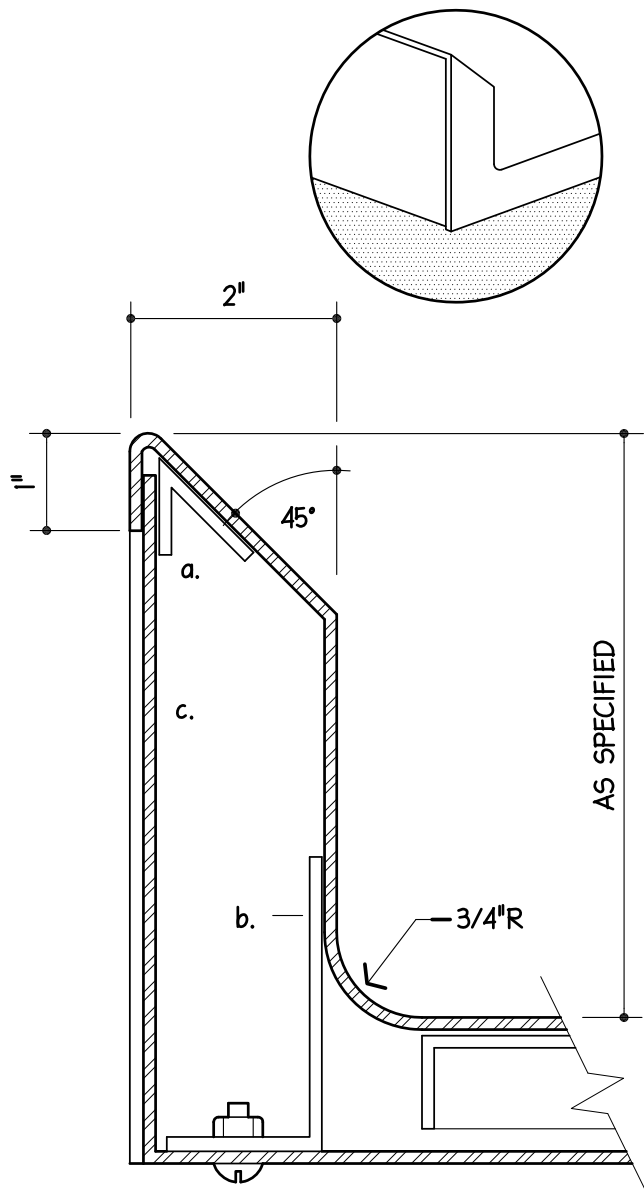
TURNED DOWN EDGE M.



WALL UNIT

DETAIL A

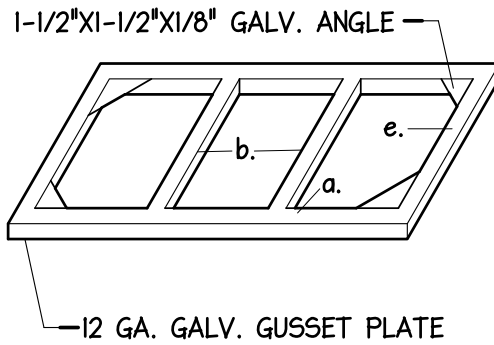
- a. 2-1/2" AT SINK TO ALLOW FOR CONNECTED OVERFLOW
- b. 12 GA. S/S CLIPS, 4" LONG, FASTENED TO EACH WALL END OF EACH UNIT & 4'-0" ON CENTER. SECURE TO WALL W/A MINIMUM OF TWO 1/4"x20 S/S TOGGLE BOLTS OR EXPANSION SHIELDS.
- c. EXPOSED ENDS TO BE FULLY WELDED CLOSED.
- d. SEAL ALL AROUND TO WALL WITH SILICONE SEALANT.



FREE STANDING UNIT

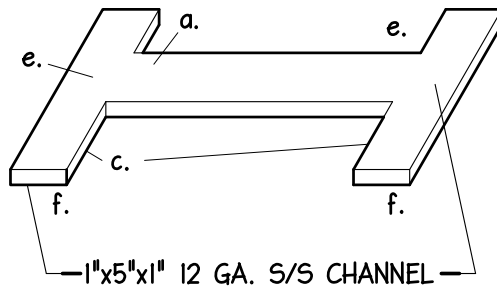
DETAIL B

- a. 1"x1"x14 GA. S/S x1-1/2" LONG RETAINING CLIP WELDED IN PLACE. ONE AT EACH END OF UNIT AND 12" ON CENTER.
- b. 2-1/2"x1-1/2"x1-1/2" 14 GA. S/S CLIP WELDED TO SPLASH. ONE AT OF EACH UNIT & 12" ON CENTER.
- c. 14 GA S/S PANEL SECURED TO CLIPS W/ S/S OVALHEAD BOLT. WELD NUT TO CLIP.
- d. EXPOSED ENDS TO BE FULLY WELDED.



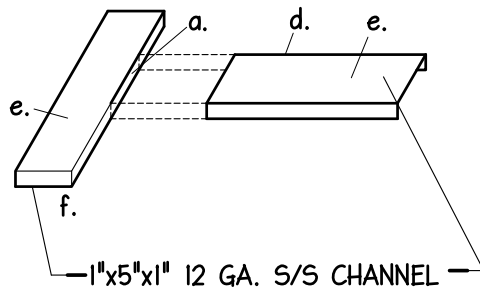
TABLES

A.



DISHTABLES

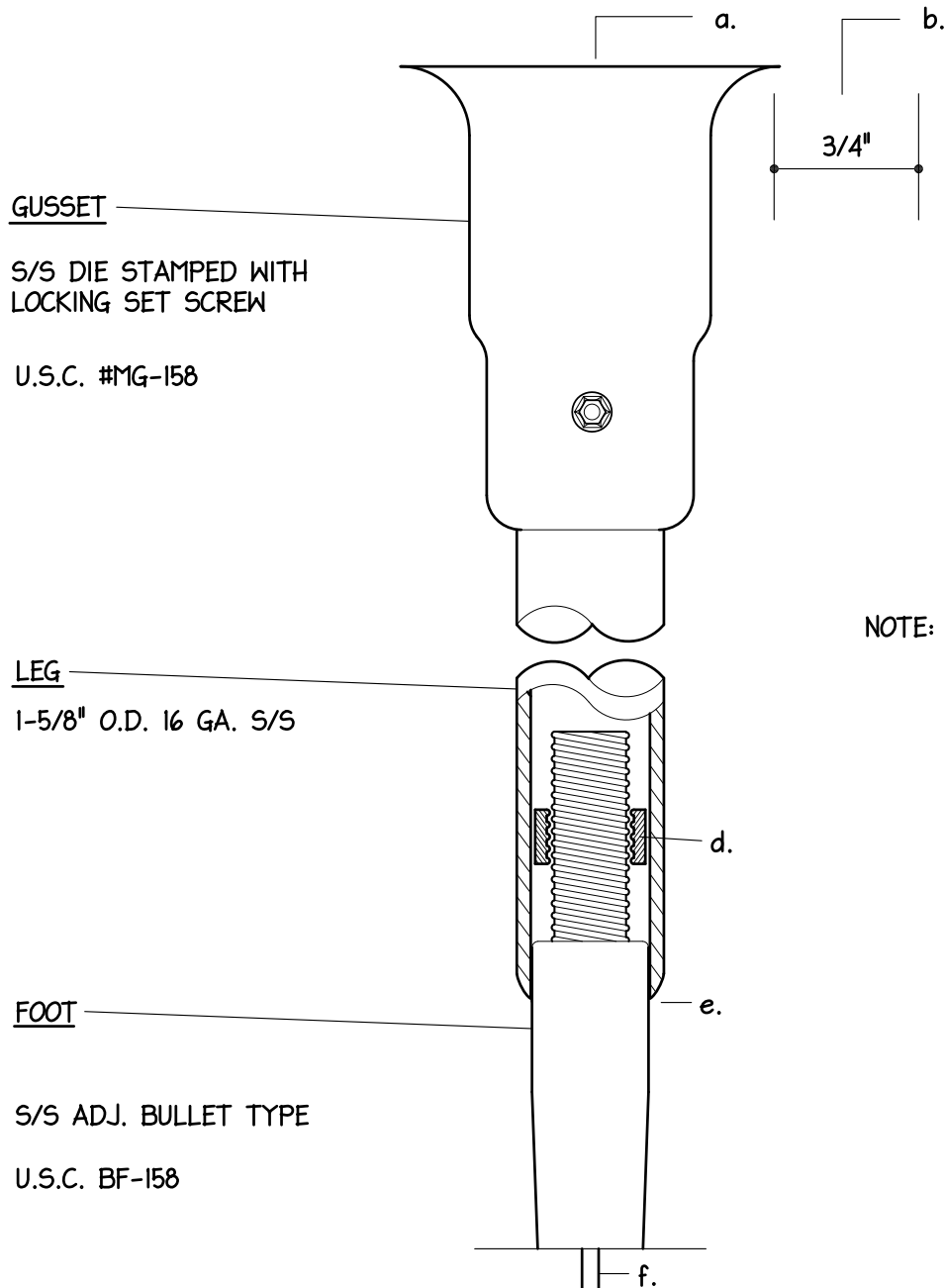
B.



SINK DRAINBOARDS

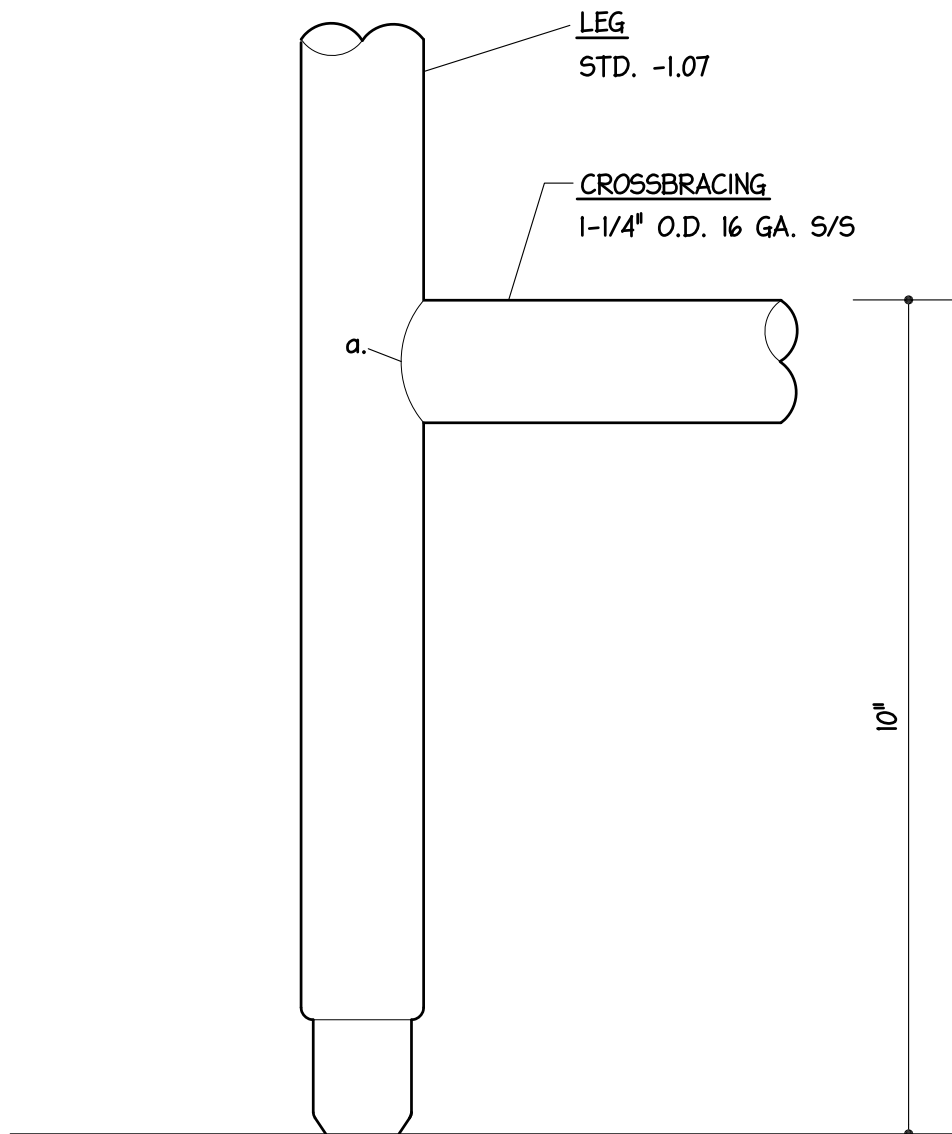
C.

- a. FULLY WELDED CONSTRUCTION.
- b. ANGLE LOCATION - ENDS; SIDES OF TOP INSETS; INTERMEDIATES
24" ON CENTER.
- c. CHANNEL LOCATION - ENDS AND INTERMEDIATE MAXIMUM 6'-6" O.C.
- d. ADD CENTER CHANNEL WHEN DRAINBOARD LENGHT EXCEEDS 2'-0".
- e. SECURE TOP TO FRAMEWORK WITH WELDED STUDS, S/S LOCKWASHERS
AND CAP NUTS.
- f. CLOSE CHANNEL AT FRONT ONLY.

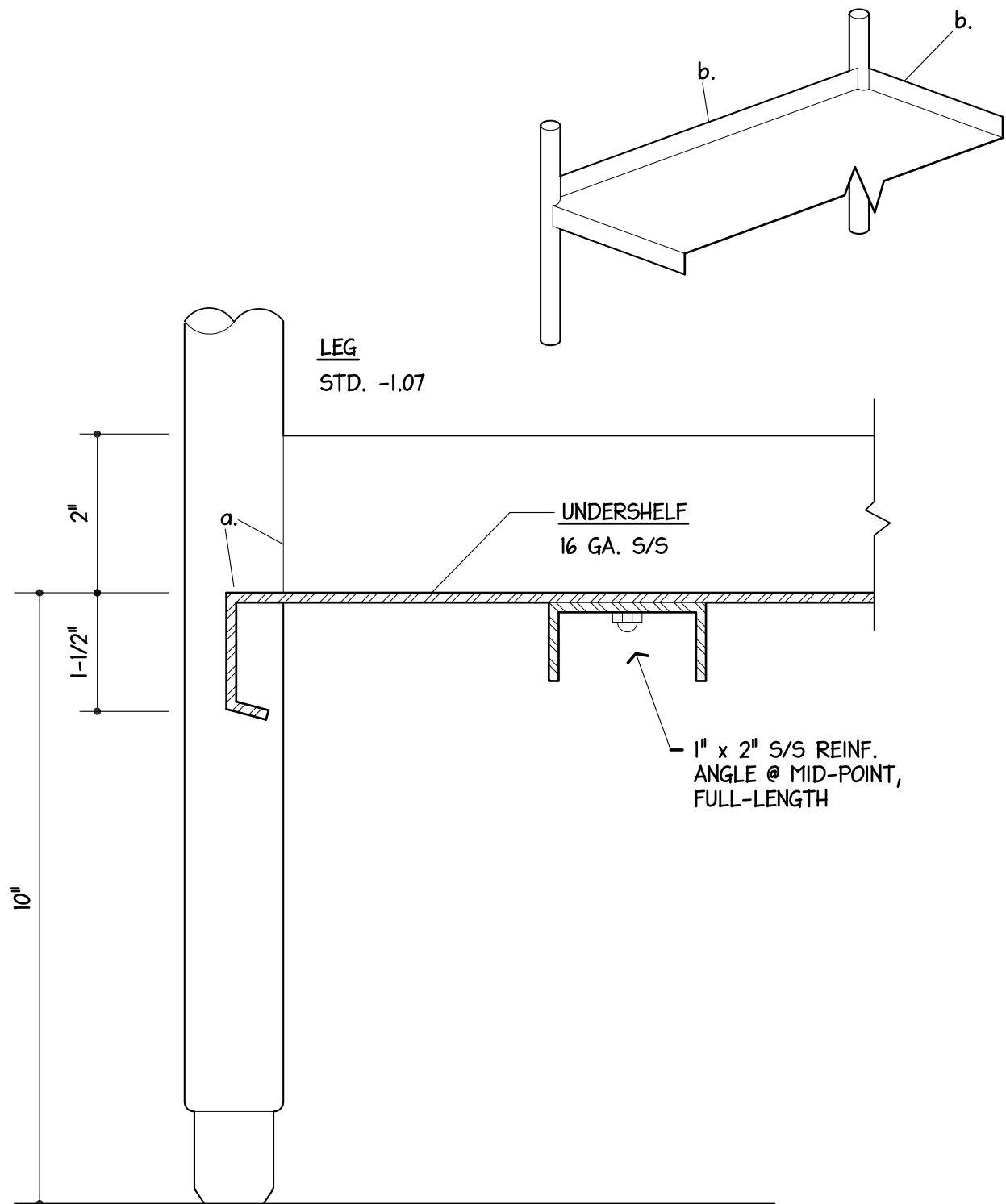


NOTE: ENTIRE FINISHED
STRUCTURE AND
INDIVIDUAL COMPONENTS
TO MEET NSF
REQUIREMENTS

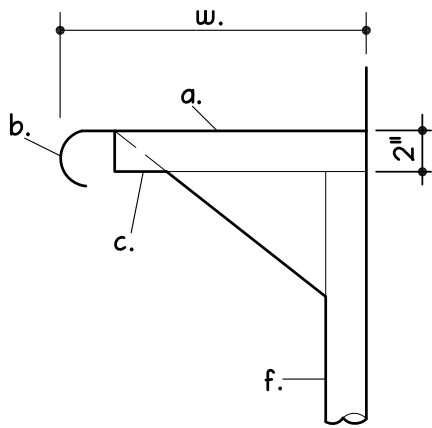
- a. FULLY WELD GUSSET TO FRAMEWORK OR SINK
- b. 3/4" MINIMUM CLEARANCE ALL AROUND
- c. SET SCREW NOT VISIBLE TO WORKING SIDE OF EQUIPMENT.
- d. MAXIMUM 1/32" CLEARANCE BETWEEN LEG AND FOOT
- e. FOOT SET AT MIDPOINT TO ALLOW 1" ADJUSTMENT UP AND 1" DOWN.
WITHOUT THREAD EXPOSURE.
- f. LEGS UNSUPPORTED Laterally BY CROSSBACKING OR UNDERSHELVES SHALL BE
PINNED TO FLOOR USING 1/4" DIA. X 1/2" PINS WELDED TO FOOT AND SET IN
MATCHING HOLES IN THE FLOOR.



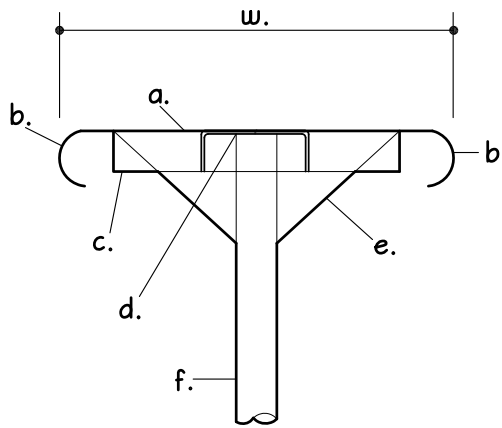
a. FULLY WELD, GRIND SMOOTH AND POLISH.



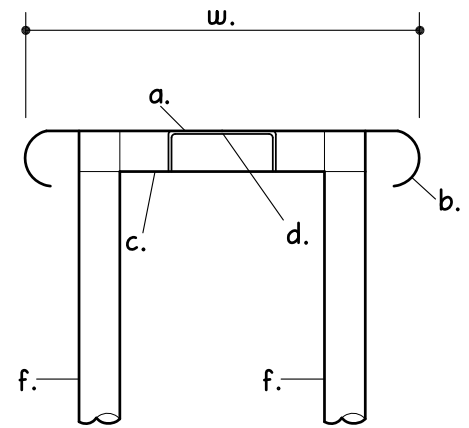
- a. FULLY WELD, GRIND SMOOTH AND POLISH.
- b. WHEN SPECIFIED, TURN REAR AND ENDS UP 2".



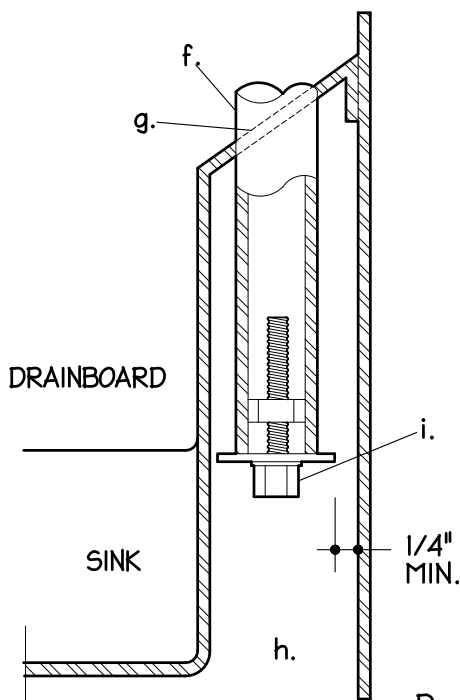
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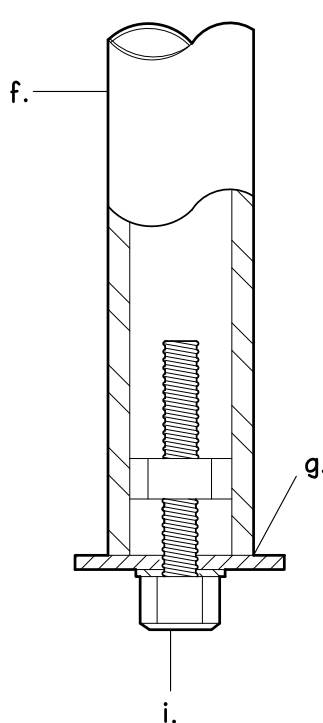
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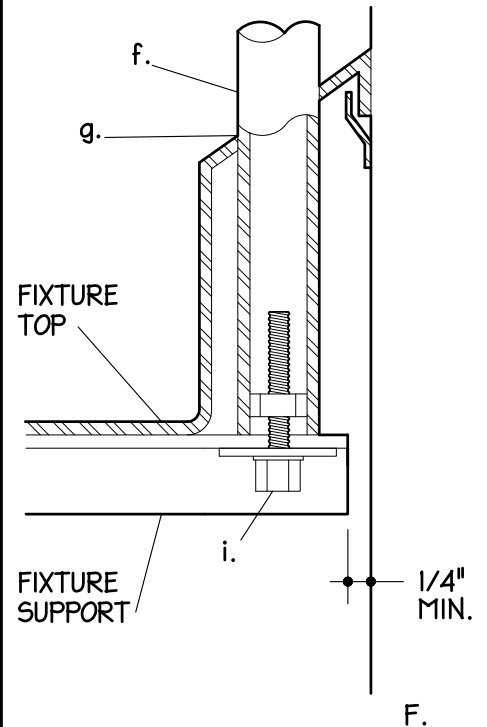
C.



D.

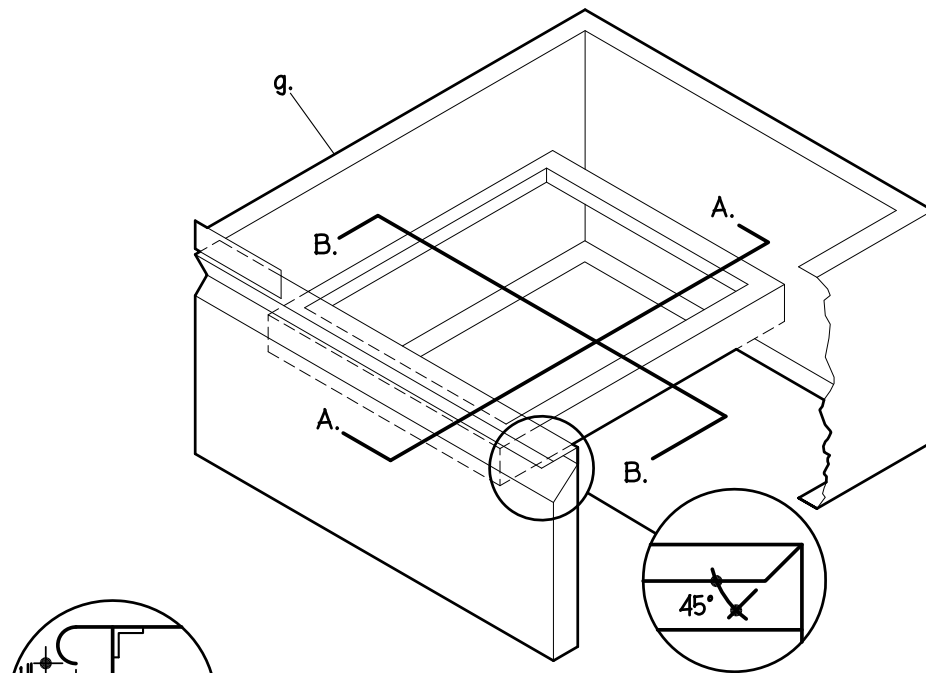


E.



F.

- a. 16 GA S/S SHELF
- b. STD.- 1.02 EDGE
- c. 1"x 3"x 1" 14 GA. S/S CROSS CHANEL
- d. 1"x 3"x 1" 14 GA. S/S LENGTHWISE CHANNEL WHEN LENGTH BETWEEN SUPPORTS EXCEEDS 42"
- e. 14 GA. S/S BRACKETS FULLY WELDED TO SUPPORT AND CHANNEL..
- f. 1-1/4" O.D. 16 GA. S/S UPRIGHT. MAXIMUM 5'-0" ON CENTER.
- g. TIGHT FIT. SEAL WITH SILICONE SEALANT.
- h. 1-1/2"x 1-1/2" 12 GA. S/S CLIPS WELDED TO REAR OF SPLASH AT DRAINBOARD HEIGHT.
- i. 3/8"x 16 S.S. HEX HEAD BOLT, S/S NUT & S/S LOCKWASHER. NUT WELDED IN TUBE.
- w. WIDTH AS SPECIFIED.



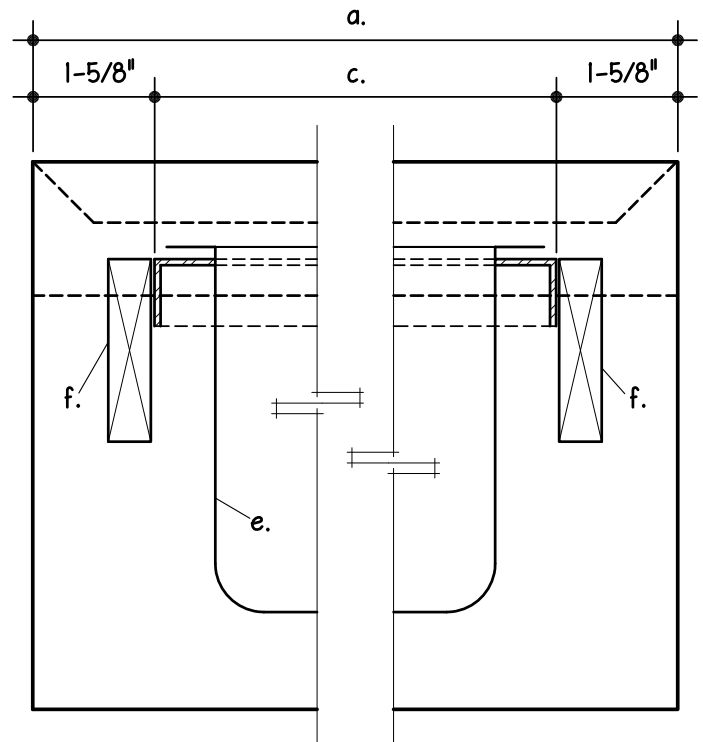
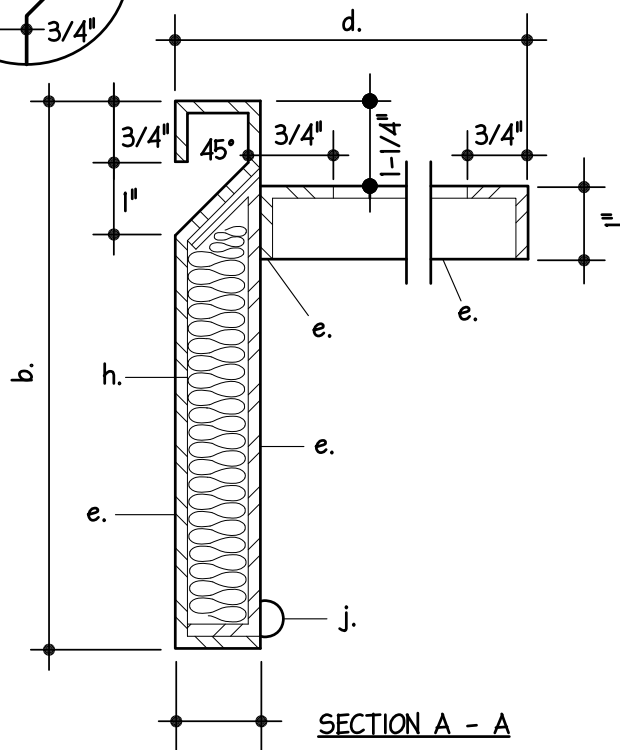
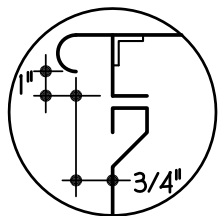
e. 16 GA. S/S ALL WELDED.

f. 3 PIECE SELF CLOSING DWR. SLIDE AS MFD. BY COMPONENT HARDWARE, S52 SERIES WITH S/S ROLLER BEARINGS. PITCH SLIDE DOWNWARD 3/8" PER FOOT FOR SELF-CLOSING ACTION.

g. 18 GA. S/S DWR. ENCLOSURE. ALL WELDED.

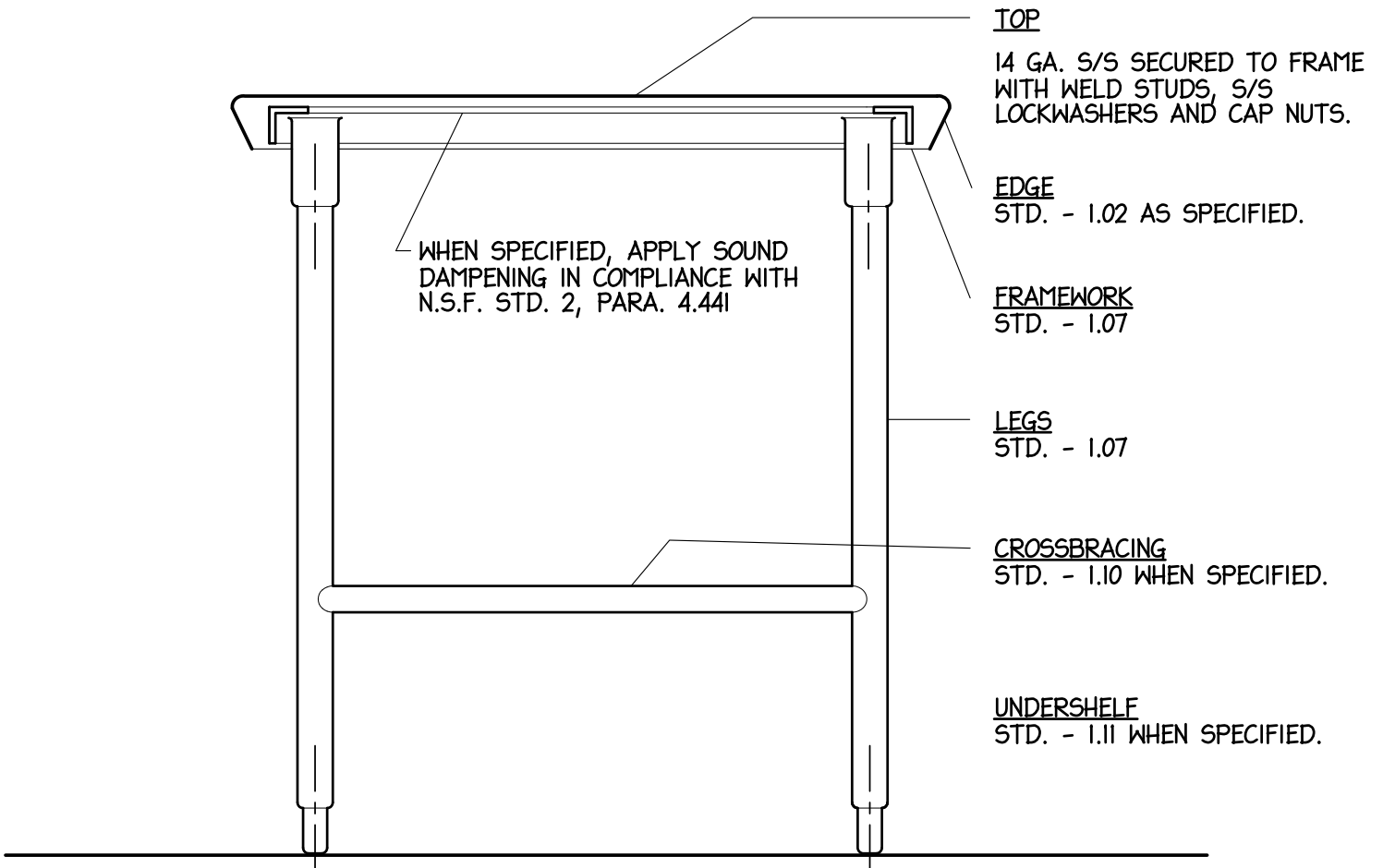
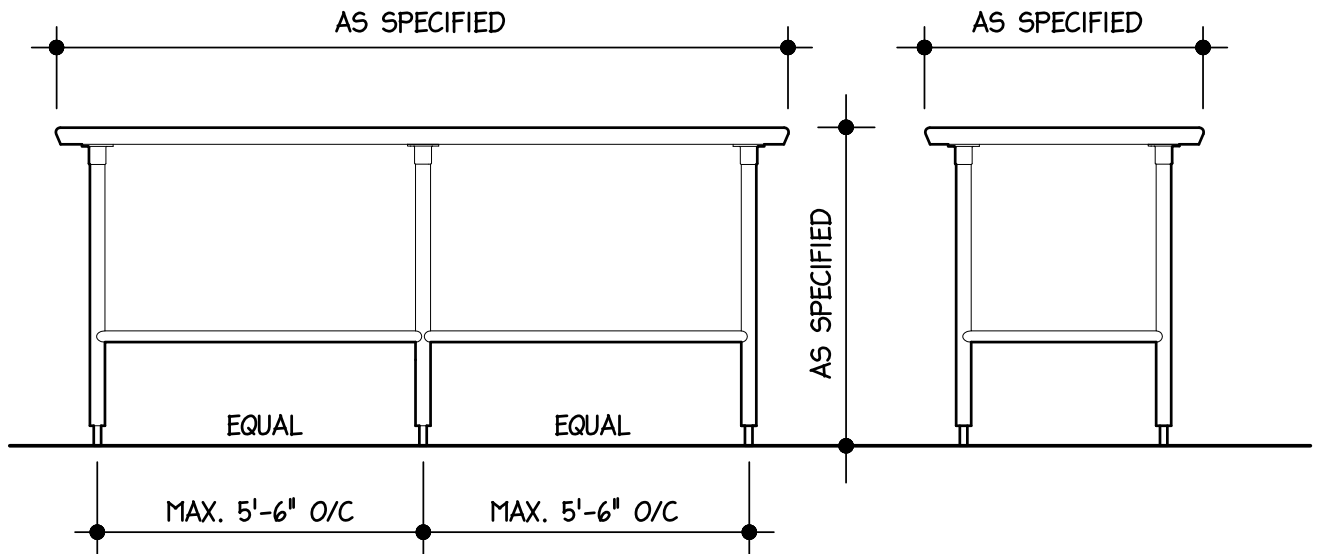
h. SEMI - RIGID FIBERGLASS SOUND DAMPENING.

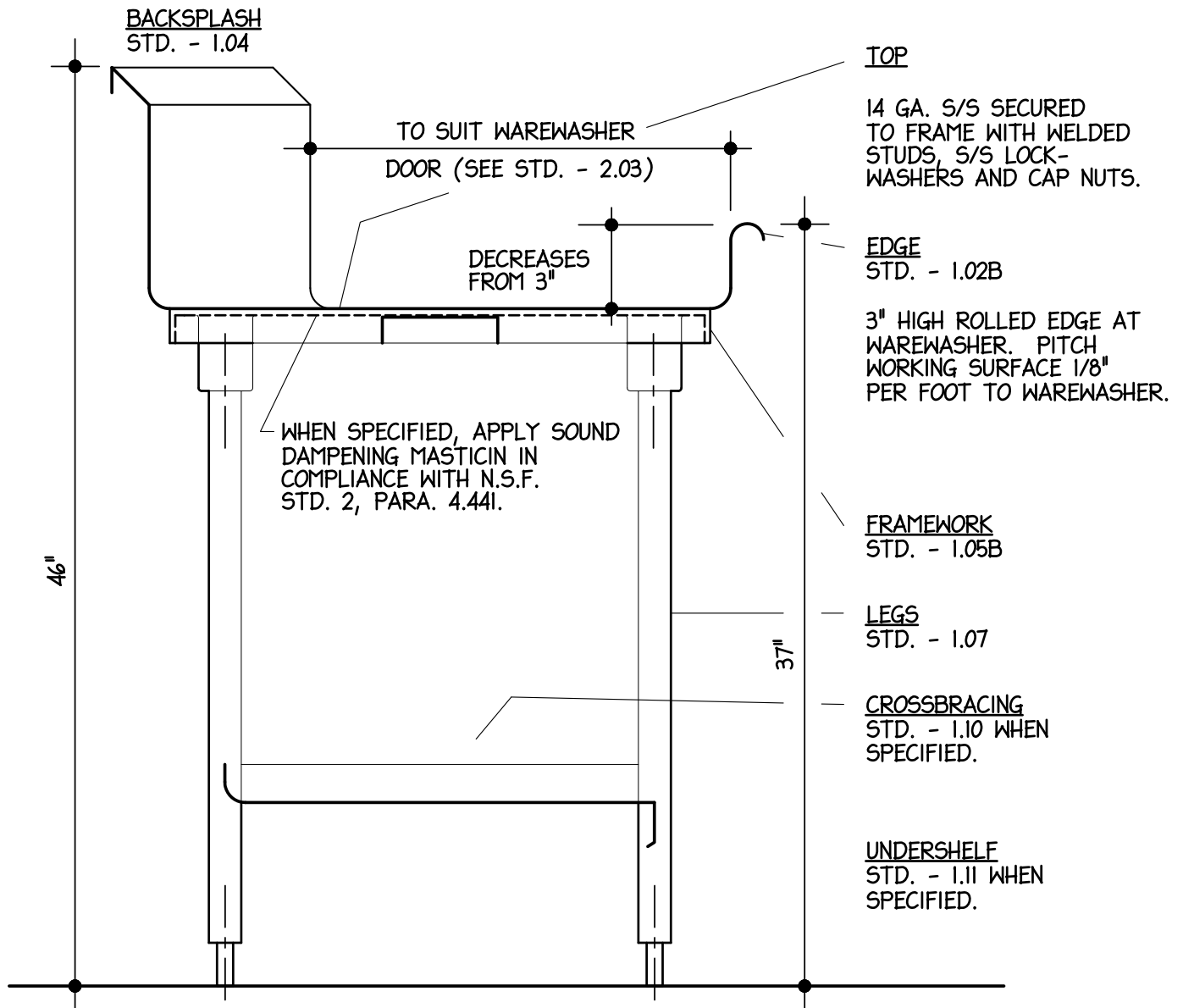
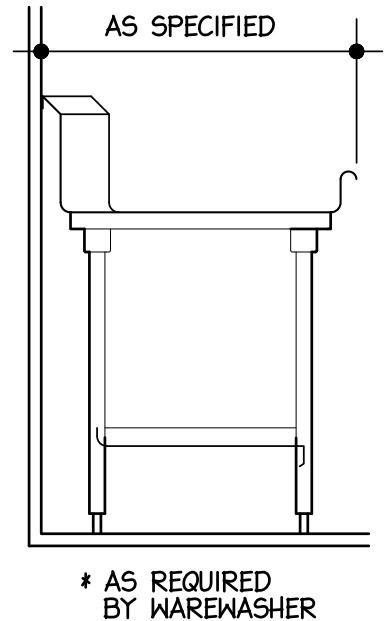
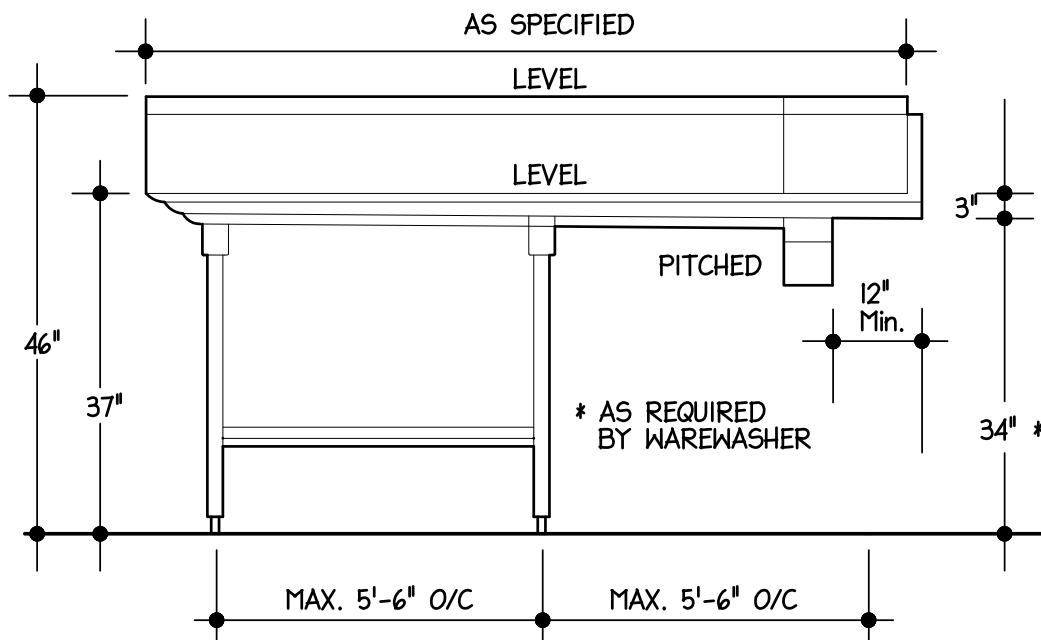
j. HARD RUBBER DRAWER BUMPER EACH CORNER.

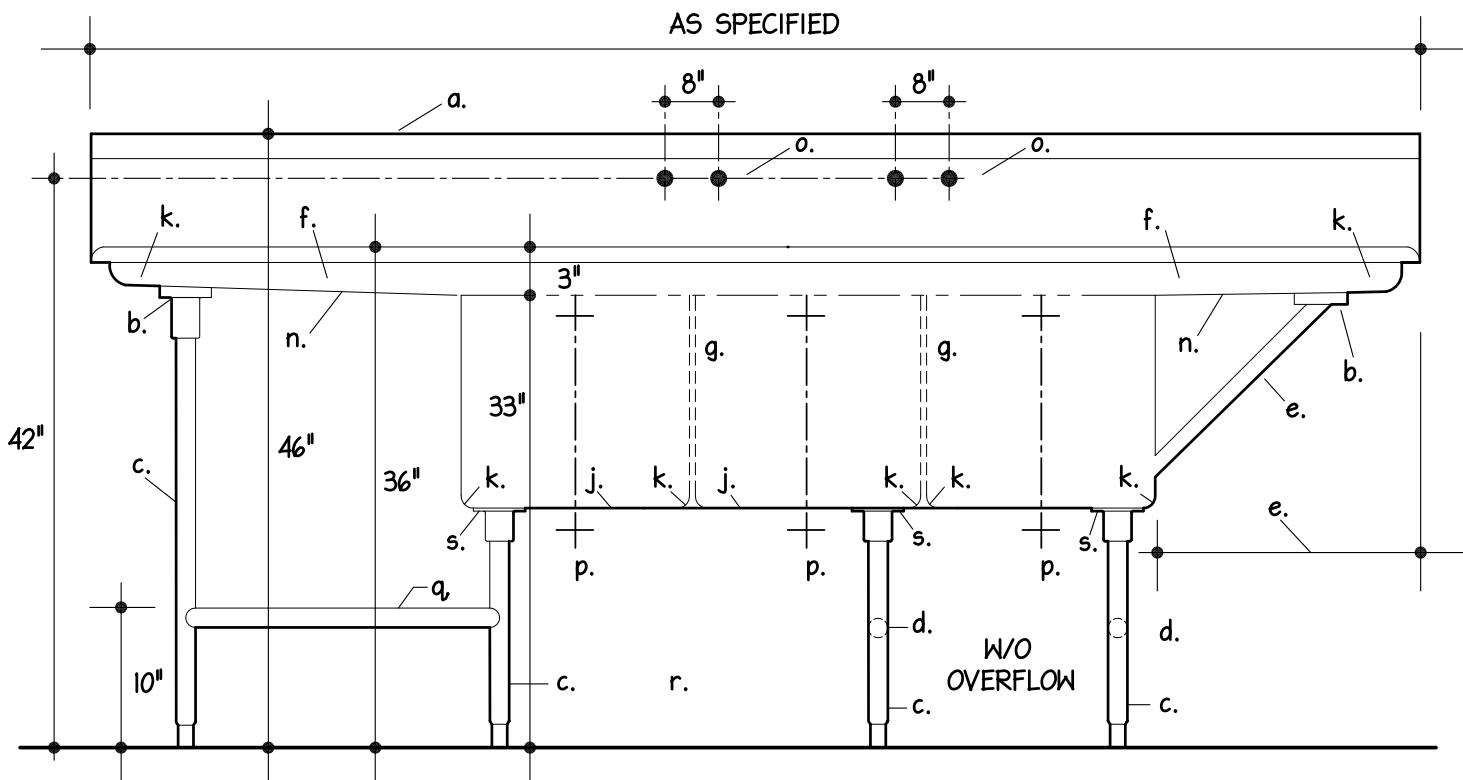


i. PROVIDE DIE - STAMPED #18 GA. S/S DWR. PANS AS FOLLOWS:

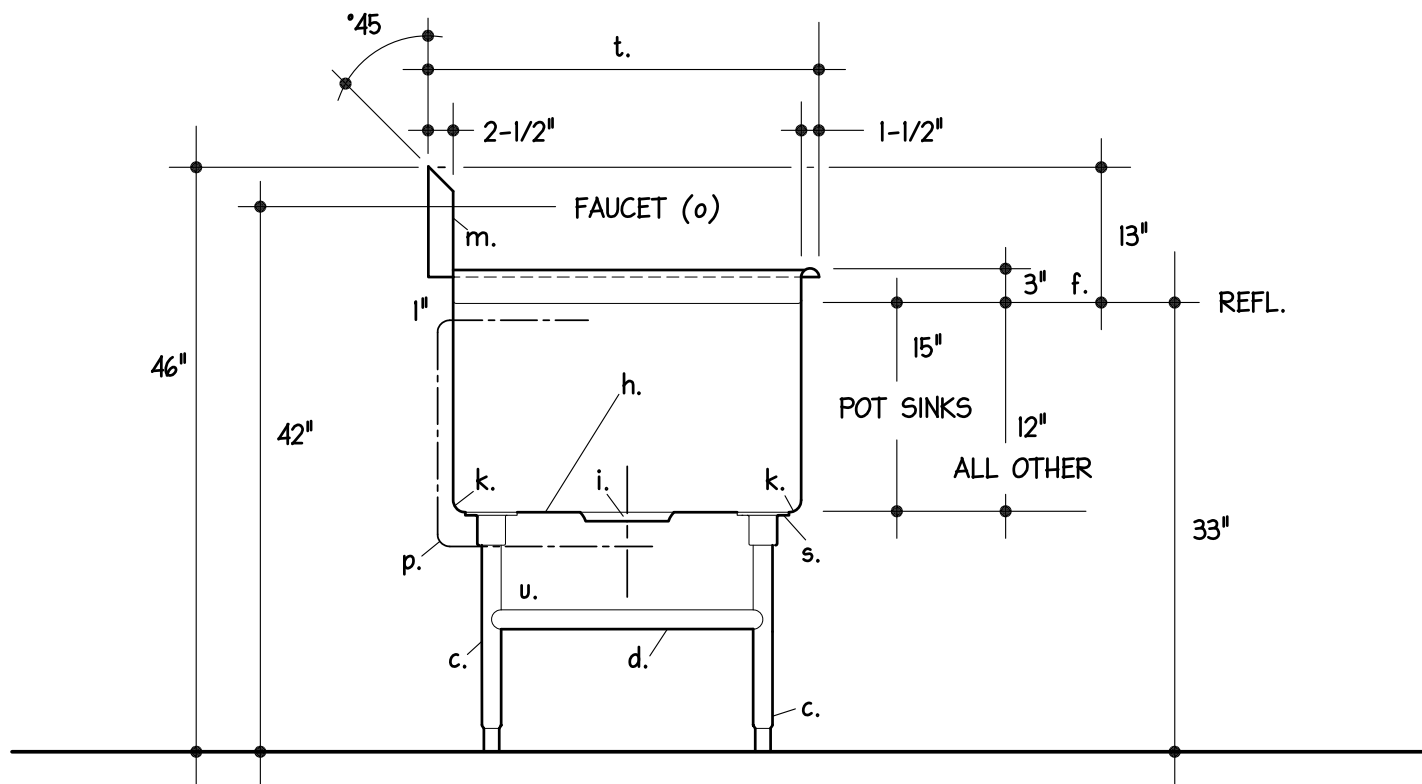
TYPE	NO.	PANS	a.	b.	c.	d.
I	1	20x20x5 DP.	25	7-1/2	21-3/4	22-3/4
II	1	20x20x8 DP.	25	10-1/2	21-3/4	22-3/4
III	1	12x20x4 DP.	25	6-1/2	21-3/4	14-1/2
IV	2	12x20x4 DP.	28	6-1/2	26-1/4	22-1/2
V	1	12x20x4 DP.	17	13-1/2	13-1/2	22-1/2







ELEVATION



TYPICAL SECTION

a. MATERIAL - 14 GA. S/S.

c. STD. - 1.07


b. STD. - 1.05c.

d. STD. - 1.10

CONTINUED ON STD.- 3.01.1

- e. DRAINBOARDS UP TO 24" IN LENGTH REQUIRE NO LEGS OR BRACES. DRAINBOARDS 25" TO 30" REQUIRE 1" O.D. 16 GA. S/S BRACE. DRAINBOARDS OVER 30" REQUIRE LEGS AND CHANNEL FRAMEWORK.
- f. DRAINBOARDS SHALL PITCH TO SINK 1/8" PER FOOT OF LENGTH TO PROVIDE COMPLETE DRAINING WITHOUT POOLING. THE 3" HIGH RAISED ROLLED RIM AT THE SINK SHALL DECREASE IN HEIGHT TOWARD THE OUTER ENDS OF THE DRAINBOARD.
- g. PARTITIONS BETWEEN COMPARTMENTS TO BE DOUBLE WALLED CONSTRUCTION WITH ROUNDED TOP, ALL WELDED INTEGRAL WITH SINK BODY.
- h. BACK, BOTTOM, AND FRONT SHALL BE ONE CONTINUOUS PIECE WITH ENDS WELDED INTEGRAL, WITHOUT OVERLAPPING JOINTS OR OPEN SPACES, BETWEEN COMPARTMENTS.
- i. WASTES SHALL BE SEATED IN DIE STAMPED DEPRESSIONS WITHOUT USE OF SOLDER, RIVETS OR WELDING. INSTALLED COMPONENTS SHALL BE FLUSH WITH SURROUNDING SURFACE.
- j. EACH SINK COMPARTMENT TO BE PITCHED AND CREASED TO WASTE TO ASSURE COMPLETE DRAINING WITHOUT POOLING.
- k. ENTIRE UNIT SHALL BE ALL WELDED COVE CORNERED CONSTRUCTION WITH VERTICAL AND HORIZONTAL AND INTERIOR CORNERS HAVING A 3/4" RADIUS.
- l. STD.- 1.02 b EDGE.
- m. STD. - 1.04a. BACKSPLASH.
- n. UNDERSIDE OF DRAINBOARDS AND SINKS TO BE SPRAYED WITH SOUND DAMPENING IN COMPLIANCE WITH N.S.F. STD. 2 PARA 4.44I WHEN SPECIFIED.
- o. FAUCETS - T&S MODEL B-232 WITH AERATOR B-199, REMOVABLE MONEL SEATS AND 1/2" I.P.S. MALE INLETS.
- p. WASTES - 2" NICKEL PLATED BRONZE ROTARY HANDLE WASTE S/S STRAINER PLATE WITH CHROME WITH CHROME PLATED BRASS CONNECTED OVERFLOW, STANDARD- KIEL HARDWARE MFG. CO. #1770-1015-1000.
- q. REAR CROSS BRACING ONLY.
- r. OMIT FRONT AND REAR LENGTHWISE CROSSBRACIG UNDER SINKS.
- s. 12 GAUGE STAINLESS STEEL 6"x 6" TRIANGULAR SUPPORT PLATE WELDED TO UNDERSIDE OF SINKS.
- t. WIDTH AS SPECIFIED.

(END OF SECTION 114000)

 NYIKOS ASSOCIATES, INC. Food Facilities Design/Consulting	DESCRIPTION: <div style="text-align: center;">SINK AND DRAINBOARDS</div>	STANDARD DTL: <div style="text-align: center;">3.01.1</div>
		PAGE: <div style="text-align: center;">114000-59</div>

SECTION 11 52 13.19
REAR PROJECTION SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrically operated, flexible rear-projection screens and controls.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for metal support framing for rear-projection screens.
 - 2. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood backing for screen installation.

1.3 DEFINITIONS

- A. Gain: Ratio of light refracted by screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94, except that for measuring luminance of test screen, projection lamp shall be placed behind screen same distance as it was placed in front of magnesium carbonate surface for measuring luminance of reference standard.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show layouts and types of rear-projection screens. Include the following:
 - 1. For electrically operated, flexible rear-projection screens and controls:
 - a. Location of wiring connections for electrically operated units.
 - b. Drop lengths.
 - c. Anchorage details, including connection to supporting structure for suspended units.
 - d. Details of juncture of exposed surfaces with adjacent finishes.
 - e. Accessories.

f. Wiring diagrams.

C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For rear-projection screens to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install rear-projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Store rear-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.7 COORDINATION

A. Coordinate layout and installation of rear-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Rear-Projection Screens: Obtain rear-projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.

2.2 ELECTRICALLY OPERATED, FLEXIBLE REAR-PROJECTION SCREENS

A. General: 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 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. Controls: Remote, key-operated, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.

- a. Provide power supply for low-voltage systems if required.
- b. Provide infrared remote control consisting of battery-powered transmitter and receiver.

- c. Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.
- 3. Motor in Roller: Instant-reversing motor of size and capacity recommended 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.
- 4. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- (9.5-mm-) diameter metal rod with ends of rod protected by plastic caps.
 - a. Roller is supported by vibration- and noise-absorbing supports.
- 5. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of screen by tabs to pull screen flat horizontally.
- B. Suspended, Electrically Operated Screens with Automatic Ceiling Closure: Motor-in-roller units designed and fabricated for suspended mounting; with bottom of case composed of two panels, fully enclosing screen, motor, and wiring; one panel is hinged and designed to open and close automatically when screen is lowered and fully raised, and the other is removable or openable for access to interior of case.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Draper Inc.; Premier Electric Projection Screen or a comparable product by one of the following:
 - a. Da-Lite Screen Company.
 - b. Stewart Filmscreen Corporation.
 - 2. Provide metal or metal-lined wiring compartment.
 - 3. Screen Case: Made from metal.
 - 4. Provide screen case with trim flange to receive ceiling finish.
 - 5. Finish on Exposed Surfaces: Vinyl covering or baked enamel.

2.3 FLEXIBLE REAR-PROJECTION SCREEN MATERIAL

- A. Moderate-Gain Screens: Coated vinyl sheet with peak gain of not less than 1.3, and half-gain angle of at least 30 degrees from the axis of the screen surface.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Draper, Inc.; Cineflex CH1200V. or a comparable product by one of the following:
 - a. Da-Lite Screen Company.
 - b. Stewart Filmscreen Corporation.
- B. Mildew-Resistance Rating: Zero or 1 when tested according to ASTM G 21.
- C. Flame Resistance: Passes NFPA 701.
- D. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.
- E. Seamless Construction: Provide screens, in sizes indicated, without seams.

- F. Size of Viewing Surface: 176 inches wide by 110 inches high.
- G. Provide extra drop length of dimensions and at locations indicated.
 - 1. Color: Black.
 - 2. Length: As required to bring screen to 36 inches above platform floor level.

PART 3 - EXECUTION

3.1 FLEXIBLE REAR-PROJECTION SCREEN INSTALLATION

- A. Install rear-projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install rear-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
 - 1. Install low-voltage controls according to 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 11 52 13.19

SECTION 11 61 43 STAGE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Stage curtains.
2. Draw-curtain tracks.
3. Curtain rigging.

- B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for steel framing and supports for stage-curtain systems.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product and the following:

1. Tracks: Capability of each track to support the weight and operation of curtains that it supports.

- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and attachment details of curtains.
2. Include fabric assembly and hanging details.
3. Dimension operating clearances.
4. Include documentation of capacity of each batten, track, attachment, and rigging component to support loads.
5. Points of attachment for proscenium curtain and the corresponding static and dynamic loads imposed on structure.
6. Locations of equipment components, switches, and controls. Differentiate between manufacturer-installed and field-installed wiring.

- C. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing full range of colors, textures, and patterns available, together with 12-inch- (300-mm-) square Sample (any color) of each fabric type and seam.
- D. Samples for Verification: Full width by minimum 12-inch- (300-mm-) long section of each fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
- E. Delegated-Design Submittal: For stage-curtain systems and attachments to structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which tracks, battens, and other stage-curtain equipment will be attached.
 - 2. Locations of lighting fixtures and cabling, ductwork, piping, and sprinklers.
 - 3. Rigging equipment for stage equipment.
 - 4. Access panels.
- B. Qualification Data: For Installer.
- C. Product Certificates: For the following, from manufacturer:
 - 1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
 - 2. Rigging: Compliance of suspended battens and tracks with requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of stage curtains.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stage curtains until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and 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. Field Measurements: Verify locations of supporting structural elements and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of rigging.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STAGE-CURTAIN SYSTEMS

- A. Description: Complete stage-curtain systems, including stage curtains, tracks, draw-curtain machines, and rigging; with necessary accessories for support and operation.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baron Stage Curtain & Equipment.
 - b. H & H Specialties, Inc.
 - c. iWeiss Theatrical Solutions.
 - d. Janson Industries.
 - e. JR Clancy.
 - f. Sapsis Rigging Inc.
 - g. SECOA.
 - h. Stagecraft Industries, Inc.
- B. Source Limitations: Obtain stage-curtain systems from single manufacturer. Obtain each color, grade, finish, type, and variety of fabric from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads and the following loads and stresses:
 - 1. Design Loads: Weight of curtains and a safety factor of not less than six (6).
- B. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame-Propagation Resistance: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-

retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.

- b. Permanently attach 12-inch- (300 mm-) square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

2.3 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.
- B. Heavyweight Polyester Velour: Napped fabric of 100 percent polyester weighing not less than 24-25 oz./linear yd. (744-775 g/linear m), with pile height approximately 75 mils (1.9 mm); inherently and permanently flame resistant; 54-inch (1372-mm) minimum width.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide KM Fabrics, Inc. ; Prestige. or a comparable product by one of the following:
 - a. Dazian LLC.
 - b. Fred Krieger Fabrics.
 - c. JB Martin Company.
 - d. Milliken & Company.
 2. Color/Texture/Pattern: As selected by Architect from manufacturer's full range.
- C. Lightweight Polyester Velour: Napped fabric of 100 percent polyester weighing not less than 14 oz./linear yd. (434 g/linear m), with pile height approximately 75 mils (1.9 mm); inherently and permanently flame resistant; 54-inch (1372-mm) minimum width.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Fred Krieger Fabrics; Prism Velour. or a comparable product by one of the following:
 - a. Dazian LLC.
 - b. JB Martin Company.
 - c. KM Fabrics, Inc.
 - d. Milliken & Company.
 2. Color/Texture/Pattern: As selected by Architect from manufacturer's full range.

2.4 CURTAIN-BOTTOM WEIGHTS

- A. Individual Weights: Curtain manufacturer's standard segmented weights to suit each curtain type and location.
- B. Weight Tape: Curtain manufacturer's standard, continuous weight tape to suit each curtain type and location.
- C. Pipe or Conduit Weight and Stiffener: Curtain manufacturer's standard or recommended stiffening pipe or conduit that slides into bottom hem, suitable for curtain type and location indicated.
- D. Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A 413/A 413M.

2.5 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width. Orient velour fabric with the fabric nap down.
- B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:
 - 1. Vertical Hems: Minimum 2 inches (50 mm) wide, and not less than 4 inches (102 mm) wide at borders, valance, teasers, and tormentors, with not less than a 1-inch (25-mm) tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.
 - 2. Turnbacks: Provide leading-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches (300 mm) of face fabric, with not less than a 1-inch (25-mm) tuck, and vertically secured by sewing.
 - 3. Top Hems: Reinforced by double-stitching 3-1/2-inch- (89-mm-) wide, heavy, jute webbing to top edge on back side of curtain with not less than 2 inches (50 mm) of face fabric turned under.
- C. Fullness:
 - 1. Flat: Provide zero (0) percent fullness in curtains.
 - 2. 50 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by spaced at 12 inches (300 mm) o.c. along top hem reinforcement.
- D. Grommets: Brass, No. 3, or No. 4.
 - 1. Black Curtains: Provide brass or aluminum grommets with black finish.
 - 2. Flat Curtains: Provide blind grommet top finish to mask battens using hidden pairs of grommets; place 12 inches (300-mm) o.c. and 1 inch (25 mm) from corner of curtain; for ties.
 - 3. Pleated Curtains: Center grommets on each box pleat and place 1 inch (25 mm) from corner of curtain; for snap hooks or S-hooks.
- E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:
 - 1. For Flat Curtains Without Fullness: 4-inch (100-mm) lined hem with pocket for sliding pipe or conduit weight and stiffener into bottom of curtain, and with a concealing flap of same fabric in front of pocket made 2 inches (50 mm) longer than bottom edge of pocket.
 - 2. For Curtains With Fullness:
 - a. Curtains That Do Not Hang to Floor: Hems not less than 3 inches (75 mm) deep, with 3/4-inch (19-mm) weight tape, and with open ends of hems sewn closed.
 - b. Floor-Length Curtains: Hems not less than 6 inches (150 mm) deep; with separate, interior, 100 percent cotton, heavy canvas chain pockets equipped with proof coil chain; with chain pockets sewn so that chain rides 2 inches (50 mm) above finished bottom edge of curtain; and with open ends of hems sewn closed.
 - 3. Lining: Where indicated, provide lining for curtain in same fullness as face fabric and finished 2 inches (50 mm) shorter than face fabric. Sew or otherwise securely attach lining to top hem of face fabric. Attach lining to face fabric along bottom and side seams with 4-inch- (100-mm-) long strips of heavy woven cotton tape.

2.6 CURTAIN ACCESSORIES

- A. S-Hooks: Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches (50 mm) long.
- B. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, black or white to best match curtain; not less than 5/8 inch (16 mm) wide by 36 inches (900 mm) long, threaded through grommets.
- C. Snap Hooks: Manufacturer's standard heavy-duty hooks, attached to top hem with nylon strap secured by rivets.

2.7 ALUMINUM CURTAIN TRACK

- A. Aluminum Track: Extruded aluminum, ASTM B 221 (ASTM B 221M); alloy and temper as recommended by manufacturer for strength and corrosion resistance; mill finish; complete with necessary accessories for support and operation.
 - 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. Automatic Devices Company.
 - b. H & H Specialties Inc.
 - c. Tru-Roll, Inc.
 - 2. Curved Track: Fabricate curved portions of track in shop.
 - 3. Cable Guides for Curved Track: Outside idlers, mule pulleys, spindles, and guides; quantity sufficient for configuration of curve(s) and length of track.
 - 4. Aluminum Thickness: As recommended by manufacturer for loads and operation.
- B. Curtain Rails: Single or double curtain capacity as indicated. Provide end stops for track rails.
- C. Curtain Carriers: Standard carriers with a pair of nylon-tired ball-bearing wheels riveted parallel to plated-steel body. Equip carriers with rubber or neoprene bumpers and nylon glide strips to reduce noise, and heavy-duty, plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.
 - 1. Master Curtain Carriers: One (1) master carrier, for each leading curtain edge, with two (2) pairs of nylon-tired ball-bearing wheels riveted parallel to plated-steel body.
- D. Curved-Suspended-Track Stiffener: NPS 1-1/2 (DN 40) steel pipe for supporting both sections of suspended curved tracks; curved to match track.
- E. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- F. Track-Lap Clamp: Metal to match track channel for attaching two (2) tracks at center overlap.
- G. Folding Guide: Where indicated, equip carriers with rear-fold or backpack guide and rubber spacers to fold curtain from the offstage end of the track; sized for use with operating line if any.
- H. Manual Cord Operation: Fabricate curtain track with cord, pulleys, and floor pulley.

1. Operating Line: 3/8-inch- (9-mm-) diameter, stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.
2. End Pulleys: One (1) single dead-end and one (1) double live-end pulley. Provide sheave(s) with shielded ball bearing(s) housed in plated-steel body finished to match track. Provide with bracket for securing off-stage curtain end.
3. Floor Pulley: Sheave with shielded ball bearing housed in plated-steel body, painted black. Adjustable type, with 3-inch (75 mm) wheel.

2.8 STEEL CURTAIN TRACK

- A. Steel Track: Roll-formed, galvanized, commercial-quality, zinc-coated steel sheet, ASTM A 653/A 653M; G60 (Z180) coating designation; with continuous bottom slot and with each half of track in one continuous piece; complete with necessary accessories for support and operation.
 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. Automatic Devices Company.
 - b. H & H Specialties Inc.
 - c. Tru-Roll, Inc.
 2. Curved Track: Factory-fabricated sections.
 3. Cable Guides for Curved Track: Outside idlers, mule pulleys, spindles, and guides; quantity sufficient for configuration of curve(s) and length of track.
 4. Steel Thickness: As recommended by manufacturer for loads and operation.
 - a. Heavy Duty: Minimum 0.079 inch (2.01 mm).
 - b. Medium Duty: Minimum 0.064 inch (1.63 mm).
- B. Curved-Suspended-Track Stiffener: NPS 1-1/2 (DN 40) steel pipe for supporting both sections of suspended curved tracks; curved to match track.
- C. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- D. Track-Lap Clamp: Metal to match track channel for attaching two (2) tracks at center overlap.
- E. Folding Guide: Where indicated, equip carriers with rear-fold or backpack guide and rubber spacers to fold curtain from the offstage end of the track; sized for use with operating line if any.
- F. Heavy-Duty Track System: Equip track with heavy-duty components, as recommended by manufacturer for loads and operation. Provide end stops for track.
 1. Curtain Carriers: Standard carriers of plated steel with a pair of nylon-tired ball-bearing wheels riveted parallel to body. Equip carriers with rubber or neoprene bumpers to reduce noise, and heavy-duty, plated-steel swivel eye and trim chain for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.
 - a. Master Curtain Carriers: One (1) master carrier, for each leading curtain edge, of plated steel with two (2) pairs of nylon-tired ball-bearing wheels and with two (2) line guides per carrier.

2. Pulleys: One (1) dead-end, single-wheel pulley; one (1) live-end, double-wheel pulley; and one (1) adjustable pulley to maintain proper tension on operating line; each with not less than 5-inch (125-mm) molded-nylon- or glass-filled-nylon-tired ball-bearing sheaves enclosed in steel housings. Provide pulleys with steel housing finished to match track and with bracket for securing off-stage curtain end.
- G. Medium-Duty Track System: Equip track with components, as recommended by manufacturer for loads and operation. Provide end stops for track.
1. Curtain Carriers: Standard carriers of plated steel with a pair of nylon wheels riveted parallel to body. Equip carriers with plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.
 - a. Master Curtain Carriers: One (1) master carrier, for each leading curtain edge, of plated steel with two (2) pairs of nylon wheels and with two (2) line clamps per carrier.
 2. Pulleys: One (1) dead-end, single-wheel pulley; one (1) live-end, double-wheel pulley; and one (1) adjustable pulley to maintain proper tension on operating line; each containing guarded ball-bearing sheaves enclosed in steel housings. Provide pulleys with steel housing finished to match track and with bracket for securing off-stage curtain end.
- H. Manual Cord Operation: Provide with cord operating line, 3/8-inch- (9-mm-) diameter, stretch-resistant operating cord of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

2.9 CURTAIN RIGGING

- A. Battens: Fabricated from steel pipe with a minimum number of joints. Connect pipe at joints with a drive-fit pipe sleeve not less than 18 inches (450 mm) long, and secure with four (4) flush rivets, plug welds, threaded couplings, or another equally strong method.
1. Steel Pipe: ASTM A 53/A 53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 (DN 40) nominal diameter unless otherwise indicated.
 2. Finish: Shop painted black, with a 1-inch- (25-mm-) wide yellow stripe at center of each batten.
- B. Supports, Clamps, and Anchors: ASTM A 153/A 153M, Class B, galvanized sheet steel in manufacturer's standard thicknesses, galvanized after fabrication.
- C. Trim and Support Cable: 1/4-inch- (6-mm-) diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb (3175 kg). Provide fittings according to cable manufacturer's written instructions for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- D. Trim and Support Chain: ASTM A 391/A 391M, Grade 80, hardened alloy steel chain rated for overhead lifting.
- E. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work.
- B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install stage-curtain system according to curtain and track manufacturer's written instructions.

3.3 BATTEN INSTALLATION

- A. Install battens by suspending at heights indicated with trim and supports spaced to support load, except do not exceed 10 feet (3 m) between supports.
 - 1. Cable Trim and Support: Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that are not subject to deterioration or failure with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, housed or fixed with nuts after adjustment, to prevent loosening.
 - 2. Chain Trim and Support: Secure chain with load-rated terminations.

3.4 TRACK INSTALLATION

- A. Ceiling-Mounted Track: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.
- B. Beam-Mounted Track: Install track by suspending from beam clamps securely mounted to I-beam structure at track-support spacing, according to manufacturer's written instructions.
- C. Wall-Mounted Track: Install track by suspending from brackets securely mounted to wall construction at track-support spacing, according to manufacturer's written instructions.
- D. Batten-Hung Track: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at track-support spacing, according to manufacturer's written instructions.
- E. Track-Support Spacing: According to manufacturer's recommendations for applied loads, but not exceeding the following dimensions between supports:
 - 1. Heavy-Duty Track: 72 inches (1829 mm).
 - 2. Medium-Duty Track: 48 inches (1219 mm).
 - 3. Curved Walk-Along Track: 48 inches (1219 mm), with additional supports at curves and splices.

- F. Install track for center-parting curtains with not less than 24-inch (600-mm) overlap of track sections at center, supported by track lap clamps.

3.5 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with snap hooks.
- B. Batten Hung: Secure curtains to pipe battens with S-hooks.

3.6 DRAW-CURTAIN-MACHINE INSTALLATION

- A. Install each draw-curtain machine by securely mounting to the supporting construction, according to manufacturer's written instructions.
- B. Adjust each installation to function smoothly and lubricate, as recommended by manufacturer.

3.7 DEMONSTRATION

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

3.8 CURTAIN SCHEDULE

- A. Stage Curtain ("STAGE CURTAIN"): As indicated on Drawings and as follows:
 - 1. Type: Grand drape.
 - 2. Horizontal Accessory Curtain: Valance, as noted below.
 - 3. Size and Arrangement: As indicated on Drawings.
 - 4. Fabric: Heavyweight polyester velour.
 - 5. Lining: Cotton.
 - 6. Fullness: 50 percent.
 - 7. Bottom Weights: Proof coil chain.
 - 8. Hanging Accessories: Snap hooks.
 - 9. Track: Medium-duty or heavy-duty steel with single- curtain capacity.
 - 10. Track Shape: Straight.
 - 11. Operation: Manual cord (pulley rope).
- B. Stage Curtain ("REAR CURTAIN" and "SIDE CURTAIN"): As indicated on Drawings and as follows:
 - 1. Type: Rear traveler and side curtains.
 - 2. Size and Arrangement: As indicated on Drawings.
 - 3. Fabric: Lightweight polyester velour.
 - 4. Fullness: 50 percent.
 - 5. Bottom Weights: Weight tape.
 - 6. Hanging Accessories: S-hooks.
 - 7. Track: Medium-duty steel with single- curtain capacity.
 - 8. Track Shape: Curved as indicated on Drawings.
 - 9. Operation: Manual cord (pulley rope).

- C. Stage Curtain ("STAGE CURTAIN"): As indicated on Drawings and as follows:

1. Type: Valance.
2. Size and Arrangement: As indicated on Drawings.
3. Fabric: Heavyweight polyester velour.
4. Lining: Cotton.
5. Fullness: 50 percent.
6. Bottom Weights: Proof coil chain.
7. Hanging Accessories: S-hooks.
8. Track: Medium-duty steel with single- curtain capacity.
9. Track Shape: Straight.

D. Stage Curtain ("BORDER"): As indicated on Drawings and as follows:

1. Type: Border.
2. Size and Arrangement: As indicated on Drawings.
3. Fabric: Lightweight polyester velour.
4. Fullness: 50 percent.
5. Battens: As recommended by manufacturer.

END OF SECTION 11 61 43

**SECTION 11 66 13
EXERCISE EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exercise equipment.
- B. Related Requirements:
 - 1. Section 08 83 00 "Mirrors" for mirrors over which dance equipment is attached.
 - 2. Section 11 66 23 "Gymnasium Equipment."
 - 3. Section 11 68 23 " Exterior Court Athletic Equipment."
 - 4. Section 11 68 33 "Athletic Field Equipment."
 - 5. Section 11 73 00 "Patient Care Equipment."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For exercise equipment.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, and operational clearances.
- C. Samples for Initial Selection: For each type of exercise equipment.
- D. Samples for Verification: For the following products:
 - 1. Climbing wall mat.
 - 2. Dance barre and bracket.

1.4 INFORMATIONAL SUBMITTALS

- A. Setting Drawings: For embedded items and cutouts required in other work.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For exercise equipment to include in operation and maintenance manuals.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify position and elevation of floor inserts and layout for exercise equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations: Obtain each type of exercise equipment from single source from single manufacturer.

2.2 GENERAL EXERCISE EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Draper Inc.
2. Jaypro Sports, LLC.
3. Performance Sports Systems.
4. Porter Athletic Equipment Company.

- B. Pull-up Bar: Wall mounted.

1. Fixed height.
2. Adjustable Height: In 6-inch (152-mm) increments within a range of 30 inches (760 mm).
3. Bar Length: Minimum 36 inches (910 mm).
4. Bar: Minimum 1-1/16-inch- (27-mm-) diameter, round, plated solid-steel bar.
5. Support Frame: Steel-angle end brackets attached to wood stringers, steel channels, or bars.
6. Bar Installation Height and Wall Clearance: Height as indicated on Drawings and minimum 12 inches (305 mm) from wall.

- C. Metal Finish: Manufacturer's standard factory-applied, polyester powder-coat finish.

- D. Wood Finish: Manufacturer's standard transparent or opaque-painted finish.

2.3 CLIMBING WALL EQUIPMENT

- A. Climbing Wall: Wall-mounted panels for horizontal wall climbing; with hand holds, ball holders, with safety mat cover.

1. Basis-of-Design: Subject to compliance with requirements provide Everlast Climbing, a Playcore Company; Adaptive Climbing Wall and Mat-Locking System, or comparable product.

2. Panel Size: 48 inches by 96 inches.
3. Hand Holds: 26 hand holds, 66 placement positions per panel.
4. Adaptive Hand/Foot Holds: 6 per panel.
5. Magnet: Sentence building, word, and math magnets.
6. Safety Mat Cover: 2-inch thick by 72-inch high, with cordless locking system, fire-retardant treated.
7. Finishes:
 - a. Panel Finish: Manufacturer's standard.
 - b. Metal Finish: Manufacturer's standard factory-applied, polyester powder-coat finish.
 - c. Wood Finish: Manufacturer's standard transparent or opaque-painted finish.
 - d. Mat Finish: As selected by Architect from manufacturer's full range.

2.4 DANCE EQUIPMENT

- A. Dance Barre: Wall-mounted adjustable dance barre.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Norberts Athletic Products, Inc.; Model D-400 series or a comparable product by one of the following:
 - a. Alvas, LLC.
 - b. Dance Equipment International.
 - c. Gibson Athletic.
 - d. Vita Vibe, Inc.
 2. Barre Material: Poplar, hand sanded.
 - a. Outside Diameter: 1-3/4 inches.
 - b. Warp Tolerance: 3/16 inch over 48 inches.
 3. Bracket: Channel brackets and extension studs with wing nuts.
 - a. Range of Adjustment: 14 inches minimum.
 - b. Finish: Chrome.
 - c. Bracket Spacing: 64 inches maximum.
 4. Projection: 9 inches from face of wall to outside face of barre.
 5. Barre Height Adjustment Range: 30 to 44 inches above finish floor.

2.5 MATERIALS

- A. Composite Wood Products: Products shall 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. Softwood Plywood: DOC PS 1, exterior.
- C. Equipment-Mounting Board: Wood, transparent or neutral-color-painted finish; size and quantity as required to mount exercise equipment according to manufacturer's written instructions.

- D. Anchors, Fasteners, Fittings, and Hardware: Exercise equipment manufacturer's standard corrosion-resistant or noncorrodible units; concealed.
- E. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, according to ASTM C1107/C1107M, with minimum strength recommended in writing by gymnasium-equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure, subfloors, and footings below finished floor.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Install exercise equipment after other finishing operations, including painting, have been completed unless otherwise indicated.
- C. Permanently Placed Exercise Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relationship to adjacent construction; and aligned with court layout.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed exercise equipment to structural support and to properly transfer load to in-place construction.
- E. Removable Exercise-Equipment Components: Assemble in place to verify that equipment and components are complete and in proper working order. Disassemble removable exercise equipment after assembled configuration is approved by Architect, and store units in location indicated on Drawings.

3.3 ADJUSTING

- A. Adjust movable components of exercise equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain exercise equipment.

END OF SECTION 11 66 13

**SECTION 11 66 23
GYMNASIUM EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Basketball equipment.
- 2. Volleyball equipment.
- 3. Safety pads.
- 4. Gymnasium equipment control station.

- B. Related Requirements:

- 1. Section 09 65 66 "Resilient Athletic Flooring" for game lines and markers.
- 2. Section 11 66 13 "Exercise Equipment."
- 3. Section 11 66 23 "Exterior Court Athletic Equipment."
- 4. Section 11 66 53 "Gymnasium Dividers" for equipment tied into controllers in this Section.
- 5. Section 11 68 33 "Athletic Field Equipment."

1.3 DEFINITIONS

- A. BWF: Badminton World Federation.
- B. FIBA: Federation Internationale de Basketball Amateur (The International Basketball Federation).
- C. FIVB: Federation Internationale de Volleyball (The International Volleyball Federation).
- D. NCAA: The National Collegiate Athletic Association.
- E. NFHS: National Federation of State High School Associations.
- F. USAV: USA Volleyball.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. LEED Submittals: Comply with Section 01 81 13.

1. EQ Credit 2: Low-Emitting Materials

- a. For composite wood: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

C. Shop Drawings: For gymnasium equipment.

- 1. Include plans, elevations, sections, details, and attachments to other work.
- 2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
- 3. Include transport and storage accessories for removable equipment.

D. Samples for Initial Selection: For each type of gymnasium equipment.

E. Samples for Verification: For the following products:

- 1. Pad Fabric: Wall padding minimum 3 inches (76 mm) square, with specified treatments applied. Mark face of material.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of gymnasium equipment.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain gymnasium equipment from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. LEED Requirements:
 - 1. Composite wood: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
- B. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.3 BASKETBALL EQUIPMENT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Performance Sports Systems; #3107 or a comparable product by one of the following:
 - 1. AALC Manufacturing.
 - 2. Bison, Inc.
 - 3. Draper, Inc.
 - 4. GARED Sports.
 - 5. Jaypro Sports Construction Group.
 - 6. Porter Athletic, Inc.
- B. General: Provide equipment complying with requirements in NFHS's "NFHS Basketball Rules Book."
- C. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- D. Provide manufacturer's recommended connections complying with Section 05 50 00 "Metal Fabrications" of size and type required to transfer loads to building structure.
- E. Overhead-Supported Backstops:

1. Folding Type: Manufacturer's standard assembly for backstop, with hardware and fittings to permit folding.
 - a. Backstop Type 1: Forward-folding, front-braced.
 2. Minimum Clearance in Folded Position: 22 feet above finished floor.
 3. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Center-Mast Frame: Welded with side sway bracing.
 - b. Finish: Manufacturer's standard polyester powder-coat finish.
 4. Goal Height Adjuster: Adjustable from 8 to 10 feet (2438 to 3048 mm) with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation: Electric with integral gear-drive motor, with limit switches preset to goal heights and the following:
 - 1) Operate through gymnasium equipment control station.
- F. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb (2722-kg) load capacity; one (1) per folding backstop.
1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one (1) per folding backstop.
- G. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
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. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 3. Operator Mounting: Wall-mounted board.
 4. Motor Electrical Characteristics:
 - a. Voltage: 120 V.
 - b. Horsepower: 3/4 hp.
 - c. Phase: Single.
 5. Control System: Operate through gymnasium equipment control station.
 6. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- H. Basketball Backboards:
1. Shape and Size:
 - a. Rectangular, 72 by 42 inches (1800 by 1067 mm) width by height.

2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: Minimum 1/2-inch- (13-mm-) thick, transparent tempered glass according to ASTM C1048 Kind FT (fully tempered) and with impact-testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing. Provide glass and framing system manufactured according to FIBA Level 1 or Level 2 requirement that glass does not split off if broken.
 - 1) Frame: Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, painted steel frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backstop.
 - 2) Direct Mount: Designed for mounting backboard frame to center mast of backstop, to maximize stress relief on backboard frame and glass.
 - 3) Rim-Restraining Device: According to NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced standard rules.
- I. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern that is manufacturer's standard for goal attachment.
- J. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication per manufacturer's standard design.
 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
 3. Breakaway Characteristics: Positive-lock movable breakaway design, with manufacturer's standard breakaway mechanism including preset pressure release, set to release at 230-lb (105-kg) load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 4. Field Adjustment: Provide rim that is field-adjustable for rebound elasticity without being removed from the backboard.
 5. Net Attachment: Tube tie for attaching net to rim.
 6. Finish: Manufacturer's standard finish.
- K. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit rim diameter, and as follows:
 1. Cord: Made from white nylon.
 2. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.
- L. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports per manufacturer's standard design.
 1. Attachment: Manufacturer's standard.
 2. Color: As selected by Architect from manufacturer's full range.

2.4 VOLLEYBALL EQUIPMENT ("SLEEVE")

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Sports Imports; KA25 volleyball floor sleeve and KA45 badminton/pickleball floor sleeve.
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Standard Rules: Provide equipment according to the requirements of NCAA's "Women's Volleyball Rules and Interpretations" and NFHS's "Volleyball Rules Book."
- D. Floor Insert: Chrome-finished steel floor plate and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit 3 inch post standards, minimum 9 inches (230 mm) long, to securely anchor pipe sleeve in structural floor; with anchors designed for securing floor insert to floor substrate indicated.
 - 1. Flush Floor Plate: Manufacturer's standard hinged access cover, designed to be flush with adjacent flooring. Provide two (2) tool(s) for unlocking access covers.
 - 2. Coordinate inside diameter and length required with equipment provided by Owner.

2.5 SAFETY PADS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Performance Sports Systems; 4130 Standard Neoprene Class A Foam Wall Pad or a comparable product by one (1) of the following:
 - 1. American Athletic, Inc.
 - 2. Draper Inc.
 - 3. GARED Sports.
 - 4. IPI by Bison.
 - 5. Jaypro Sports, LLC.
 - 6. Porter Athletic Equipment Company.
 - 7. Spalding Equipment.
- B. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 26 to 75.
 - 2. Smoke-Developed Index: 450 or less.
- C. Fire Test: Products tested to comply with NFPA 286.
- D. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated.
- E. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 - 1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick plywood, mat formed, or composite panel.

2. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 1-1/2-inch- (38-mm-) thick, fire-resistive neoprene; 6.0-lb/cu. ft. (96-kg/cu. m) density.
 3. Size: Each panel section, 24 inches (600 mm) wide by not less than 84 inches (2100 mm) long.
 4. Number of Modular Panel Sections: As indicated.
 5. Installation Method: Manufacturer's standard.
 6. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for two (2) color(s).
- F. Corner Wall Safety Pads: Wall corner pad consisting of not less than 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to wall.
1. Length: Each pad matching length of wall safety pads.
 2. Fabric Covering Color(s): Match color of wall safety pads for color(s).
- G. Cut-out Trim: Provide manufacturer's standard flanged cut-out trim kits for fitting pads around switches, receptacles, and other obstructions.
1. Color: As selected by Architect.

2.6 GYMNASIUM EQUIPMENT CONTROL STATION

- A. Touchscreen digital controller for operating multiple basketball backstops and divider curtains from a single location.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Performance Sports Systems; TSC1500XL or a comparable product by one of the following:
1. Draper, Inc.
 2. GARED Sports.
 3. Porter Athletic, Inc.
- C. Nominal Touchscreen Size: 7.5 inches.
- D. Accessories:
1. Relay boxes, as required to connect equipment.
 2. Display guard.
- E. Future Capability: Provide unit capable of controlling lighting, PA system, scoreboards, and other electronically controlled equipment without any additional equipment other than relay boxes.

2.7 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type indicated.
1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 2. Cast Aluminum: ASTM B 179.
 3. Flat Sheet: ASTM B 209 (ASTM B 209M).
- B. Steel: Comply with the following:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 2. Steel Tubing: ASTM A 500/A 500M or ASTM A 513, cold formed.
 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: Manufacturer's standard galvanized-stranded-steel wire rope with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with wire rope manufacturer's written instructions for size, number, and installation method.
- D. Castings and Hangers: Malleable iron, complying with ASTM A 47/A 47M; grade required for structural loading.
- E. Softwood Plywood: DOC PS 1, exterior.
- F. Particleboard: ANSI A208.1.
- G. Equipment Wall-Mounted Board: Wood, transparent finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.
- H. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- I. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C 1107/C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
1. Verify critical dimensions.
 2. Examine supporting structure, subfloors, and footings below finished floor.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.

- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 - 1. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Wall, Corner, and Column Safety Pads: Mount with bottom edge at 4 inches (102 mm) above finished floor.
- E. Cut-out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.
- F. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.
- G. Connections: Connect electric operators to building electrical system.
- H. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration is approved by Owner, and store units in location indicated on Drawings.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

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

END OF SECTION 11 66 23

**SECTION 11 66 53
GYMNASIUM DIVIDERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roll-up divider systems.
- B. Related Requirements:
 - 1. Section 11 66 23 "Gymnasium Equipment" for electronic control station.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Motors: Show mounting arrangements and wiring diagram to power source and controls.
- B. Shop Drawings: For gymnasium dividers.
 - 1. Include plans showing alignment of curtains in relation to court layout.
 - 2. Include elevations, sections, details, and attachments to other work.
 - 3. Include system clearances, stacking requirements, and limits for fitting into adjacent construction.
 - 4. Include loads, point reactions, and locations for attachment of gymnasium dividers to structure.
- C. Samples for Initial Selection: For each type of gymnasium divider curtain fabric.
- D. Samples for Verification: For divider curtain fabric, not less than 12 inches (305 mm) square of mesh and of solid fabric.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of gymnasium divider.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium dividers to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify size of space, available clearances, obstructions, and position for gymnasium dividers.

1.8 COORDINATION

- A. Coordinate installation of overhead-supported gymnasium dividers and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Electrically Operated Dividers:
 - 1. Coordinate electrical requirements for type and location of power supply, conduit, wiring, and control boxes.
 - 2. Coordinate electrical and communication requirements for electronic control station.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of gymnasium dividers.
 - b. Tearing or deterioration of fabric, seams, or other materials beyond normal use.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROLL-UP DIVIDER SYSTEMS (GYM DIVIDER)

- A. Basis-of-Design: Subject to compliance with requirements, provide Draper Inc.; Roll-up Gym Divider or a comparable product by one of the following:

1. AALCO Manufacturing.
2. ADP Lemco, Inc.
3. Arizona Courtlines, Inc.
4. Institutional Products Inc., by Bison.
5. Jaypro Sports, LLC.
6. Performance Sports Systems.
7. Revere Plastics, Inc.

B. Divider Curtain System: Electrically operated with roll-up drive pipe, and as follows:

1. Top Hem: Double-thickness mesh or solid vinyl for continuous pipe batten.
2. Outer Edge Hems: Double turned and welded.
3. Belts: Manufacturer's standard width polyester or polyurethane webbing or fabric belts, attached to top batten, passing under bottom batten, and terminating at drive pipe, with friction surface on one side of belt or other means of drawing up curtain by rolling at bottom batten.
4. Support Chain and Fittings: Hardened alloy steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
5. Curtain Battens and Drive Pipe: Fabricate from steel pipe or tubing with a minimum number of joints, as necessary for required lengths. Provide galvanized battens, or shop prime and shop finish with black paint.
 - a. Drive Pipe: 2-3/8-inch- (60-mm-) nominal diameter steel pipe.
 - b. Top Batten: 1-1/2-inch- (38-mm-) nominal diameter steel pipe.
 - c. Bottom Batten: 3-1/2-inch- (89-mm-) nominal diameter steel pipe.
6. Supplemental Supports: Manufacturer's standard steel pipe or angle framing to attach divider curtain system between building structure.

2.2 MATERIALS

- A. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangers.
- B. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil chain or other grade recommended by gymnasium divider manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.
- C. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed.

2.3 ELECTRIC OPERATORS

- A. General: Factory-assembled electric operation system of size and capacity recommended and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors, thermal-overload protection, factory-prewired motor controls, control devices, and accessories required for proper operation. Include wiring from control stations to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

- B. 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.
- C. Motor Electrical Characteristics:
 - 1. Voltage: 110 V.
 - 2. Phase: Single.
 - 3. Hertz: 60.
 - 4. Horsepower: Manufacturer's standard.
- D. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop dividers at fully extended and fully retracted positions.
- E. Control System: Operate through gymnasium equipment control station specified in Section 11 66 23 "Gymnasium Equipment."

2.4 DIVIDER CURTAINS

- A. Upper Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 9 oz./sq. yd. (305 g/sq. m).
 - 1. Mesh Color: As selected by Architect from full range of industry colors and color densities.
- B. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, 18 oz./sq. yd. (610 g/sq. m), 8-foot (2.4-m) height above floor.
 - 1. Fabric Color(s): One (1) color, as selected by Architect from full range of industry colors and color densities.
- C. Hems: Folded and electronically welded.
- D. Seams: Electronically welded.
- E. Overall Curtain Height: Floor to ceiling, within installation clearances required.
- F. Bottom of Curtain: Approximately 2 inches (50 mm) above finished floor.
- G. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, Test 2.

2.5 DIVIDER ACCESSORIES

- A. Safety Lock: Locks drive system when speed exceeds manufacturer's recommended speed.
- B. Audible Motion Alarm: Provide alarm with intermittent warning tone when curtain is raised or lowered.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, building electrical system connection types and locations, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions.
- B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, are completed.
- C. Gymnasium Dividers and Components: Install level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 - 1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure gymnasium dividers to structural support and to properly transfer load to in-place construction.
- E. Connections: Connect automatic operators to building electrical system and gymnasium equipment control station.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven tension, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.
- B. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.4 CLEANING

- A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

- B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

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

END OF SECTION 11 66 53

SECTION 11 68 23
EXTERIOR COURT ATHLETIC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Basketball equipment.

- B. Related Requirements:

- 1. Section 03 30 00 "Cast-in-Place Concrete" for concrete footings.
 - 2. Section 11 66 53 "Gymnasium Equipment" for interior basketball equipment.
 - 3. Section 11 68 33 "Athletic Field Equipment."

1.3 DEFINITIONS

- A. NFHS: National Federation of State High School Associations.

1.4 ACTION SUBMITTALS

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

- B. Shop Drawings: For exterior court athletic equipment.

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

- C. Samples: For each exposed product and for each item and color specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans and other details, drawn to scale, and coordinated with equipment, floor inserts, game lines, and markers applied to finished flooring, and coordinated with each other, using input from installers of the items involved:

- B. Setting Drawings: For embedded items and cutouts required in other work.

- C. Qualification Data: For Installer.

- D. Product Certificates: For each type of exterior court athletic equipment.

- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of exterior court athletic equipment that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Basketball backboard failures.
- b. Faulty operation of basketball backstops.

- 2. Warranty Period:

- a. Adjustable Backstops: One (1) year from date of Substantial Completion.
- b. Fixed Backstops: Lifetime warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Revise articles below to suit Project. These include paragraphs that are examples of gymnasium equipment and are not intended to be all inclusive. Indicate individual equipment or assembled system dimensions and elevations on Drawings. Use these example paragraphs as guides for developing paragraphs for other types of gymnasium equipment.

2.2 BASKETBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. AALCO Manufacturing.
- 2. Bison, Inc.

3. Jaypro Sports, LLC.
 4. Performance Sports Systems.
 5. Porter Athletic Equipment Company.
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Standard Rules: Provide equipment according to the requirements of NFHS's "Basketball Rules Book."
- D. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- E. Connections: Manufacturer's standard connections or connections recommended in writing by manufacturer and complying with Section 05 50 00 "Metal Fabrications" of size and type required to transfer loads to concrete foundation.
- F. Freestanding Adjustable Backstops:
1. Basis-of-Design: Performance Sports Systems; GP12P72DM with polycarbonate backstop, padding, and breakaway rim.
 2. Location: Rock Creek School exterior courts.
 3. Adjustable Freestanding Type: Manufacturer's standard assembly.
 4. Distance from Backboard to Post: 4 feet at 10 foot playing height.
 5. Framing: Steel tubing, and shapes designed to minimize vibration during play.
 - a. Post: 6 inch by 8 inch by 3/16 inch thick rectangular steel post.
 - b. Finish: Manufacturer's standard polyester powder-coat finish.
 6. Goal Height Adjuster: Adjustable from 7 to 10 feet (2.13 to 3.05 m) to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation:
 - 1) Manual operation with detachable crank handle.
- G. Freestanding Fixed Backstops:
1. Basis-of-Design: Performance Sports Systems; GP105S72 with steel backstop and fixed rim.
 2. Location: Walkersville Middle School exterior courts.
 3. Fixed Freestanding Type: Manufacturer's standard assembly.
 4. Distance from Backboard to Post: 5 feet.
 5. Framing: Steel tubing and shapes designed to minimize vibration during play.
 - a. Post: 6 inch by 8 inch by 1/4 inch thick rectangular steel post.
 - b. Finish: Manufacturer's standard polyester powder-coat finish.
- H. Basketball Backboards:
1. Shape and Size:
 - a. Rectangular, 72 by 42 inches (1830 by 1070 mm) width by height.
 2. Backboard Material: Provide with predrilled holes or preset inserts for mounting goals, and as follows:

- a. Polycarbonate: Minimum 1/2-inch- (13-mm-) thick, transparent polycarbonate.
 - 1) Frame: Provide polycarbonate with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, painted steel frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backstop.
- b. Steel: Single-piece, steel face sheet, minimum 0.1046-inch (2.7-mm) nominal thickness, with 1-1/2-inch- (38-mm-) deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backstop at standard mounting centers.
- 3. Polycarbonate Backboard Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced standard rules.
- 4. Steel Backboard Target Area and Border Markings: Marked in orange, with manufacturer's standard pattern and stripe width.
- 5. Finish: Manufacturer's standard factory-applied, white background.
- I. Goal-Mounting Assembly: Compatible with goal, backboard, and backstop; with 5-inch (127-mm) o.c. horizontally and vertically hole pattern for goal attachment.
 - 1. Polycarbonate Backboard Goal-Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backstop and to minimize stresses on backboard.
 - 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backstop, so that no force is transmitted by ring directly to backboard, and rigidity and stability of goal are maximized.
- J. Basketball Goals: Basket ring complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
 - 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced standard rules.
 - a. Movable: Pressure-release design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, non-movable ring.
 - b. Pressure-Release Characteristics: Positive-lock movable breakaway design, with manufacturer's standard mechanism, including preset pressure release, set to release at more than 100-lb (45.4-kg) load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, non-movable ring.
 - 2. Double-Rim Basket Ring: Fabricated with two (2) rims, consisting of one (1) 3/4-inch- (19-mm-) diameter and one (1) 5/8-inch- (16-mm-) diameter steel rod welded into 18-inch (460-mm) ID rings.
 - a. Fixed: Non-movable.
 - 3. Mount: Front.
 - 4. Net Attachment: No-tie loops for attaching net to ring without tying.
 - 5. Finish: Manufacturer's standard finish.
- K. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit ring diameter, and as follows:

1. Cord: Made from white nylon.
 2. Competition Cord: Anti-whip, made from white nylon cord, minimum 120-gm thread and maximum 144-gm thread.
- L. Backboard Safety Pads: Designed for backboard thickness and extending continuously along bottom and up sides of backboard and over backstop according to manufacturer's standard design.
1. Attachment: Manufacturer's standard.
 2. Color: Black.

2.3 MATERIALS

- A. Anchors, Fasteners, Fittings, and Hardware: Exterior court athletic equipment manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- B. Grout: Non-shrink, nonmetallic, premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout, according to ASTM C1107/C1107M, with minimum strength recommended in writing by gymnasium-equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for court layout, alignment of mounting substrates, installation tolerances, operational clearances, and other conditions affecting performance of the Work.
1. Verify critical dimensions.
 2. Examine supporting structure and footings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions and competition rules for each type of exterior court athletic equipment.
- B. Install exterior court athletic equipment after other court installation operations, including striping, have been completed unless otherwise indicated.
- C. Permanently Placed Exterior Court Athletic Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to foundations; positioned at locations and elevations indicated; in proper relationship to adjacent construction; and aligned with court layout.
1. Provide footings as recommended in writing by manufacturer.
 2. Operating Exterior Court Athletic Equipment: Verify clearances for movable components of exterior court athletic equipment throughout entire range of operation and for access to operating components.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform visual inspections and operational tests as recommended by referenced standard rules of each sport and the equipment manufacturer.
 - 2. Test rebound elasticity of basketball goals.
 - 3. Test basketball goal pressure-release characteristics and adjustability.
- B. Gymnasium equipment will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 11 68 23

SECTION 11 73 00
PATIENT CARE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Transfer lift system, ceiling track and all required supports and accessories.
 - 2. Changing tables.

- B. Related Requirements:

- 1. Section 05 50 00 "Metal Fabrications" for above-ceiling supplementary framing for support and anchorage of patient-lift systems.
 - 2. Section 06 10 53 "Miscellaneous Rough Carpentry" framing and blocking for ceiling attachments.
 - 3. Section 09 22 16 "Non-Structural Metal Framing" for supplementary metal framing and blocking for mounting items requiring anchorage.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

- B. Shop Drawings:

- 1. Include plans, elevations, sections, and details including required clearances.
 - 2. Include details of components. Indicate location and size of each field connection.
 - 3. Include diagrams for service connections and power, signal, and control wiring.

- C. Samples for Initial Selection: For each type of exposed finish.

- 1. Include Samples of accessories involving color and finish selection.

- D. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

- 1. Include Samples of accessories to verify color and finish selection.
 - 2. Ceiling-Mounted Patient-Lift Systems: Not less than 10-inch long, track sections.

- E. Product Schedule: For patient care equipment. Use same designations indicated on Drawings.
- F. Delegated-Design Submittal: For above-ceiling supplementary framing for support and anchorage of patient-lift systems, signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For ceiling-mounted patient-lift systems, reflected ceiling plan(s), and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which ceiling-mounted patient-lift systems will be attached.
 - 3. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 4. Perimeter moldings.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For products to include in operation and maintenance manuals.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install systems under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. The manufacturer shall offer a 24-month limited warranty on parts from date of shipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design above-ceiling supplementary framing for support and anchorage of patient-lift systems.

2.2 CEILING-MOUNTED PATIENT-LIFT SYSTEMS

- A. Ceiling-Mounted Patient Lift: Consisting of a motor-driven lift unit that traverses on a ceiling-mounted track system.

1. SUREHANDS Lift & Care System, Inc. (Basis of Design)
 2. Handicare USA
- B. Fixed ceiling tracks with ceiling motor lift units shall be provided at the following locations:
1. Nurse Office 202 – Model 2800
 2. Aquatics 400 (3 separate lift systems) – Model 2805
 3. Girls Locker Room 402 – Model 2800
 4. Boys Locker Room 403 – Model 2800
 5. OT/PT Office 720 – Model 2800
 6. Library 715 – Model 2800
- C. Ceiling tracks with transverse rails with ceiling motor lift units shall be provided at the following locations:
1. All Individual Classroom Toilet Rooms – Model 2800 (base bid and alternate)
 2. Sensory Room 717 – Model 2800
 3. Movement Room 718 – Model 2800
 4. Family Toilet 900B – Model 2800
- D. Ceiling-Mounted Track System: High-strength extruded aluminum in manufacturer's standard profile and thickness to support lifting capacity indicated for lift unit. Provide track shapes and accessories as required to provide a complete system in layout indicated on Drawings.
1. Width 2.1" x height 2.5"
 2. Suspension on separate support brackets (5.83" x 2.36") *with double attachment
 3. Suspension bracket every 48"
 4. Traverse (X-Y) track with parallel rails secured to ceiling/supports
 - 2 parallel rails width 2.1" x height 2.5" and a 3rd traverse rail
 - Suspension of secured rails on separate support brackets (5.83" x 2.36") *with double fastening 4.45" apart (around the 48" support bracket), anchored with threaded rods. Below a traverse rail secured to 2 trolleys. Allows free movement within a designated perimeter providing total access for staff and user to transfer locations such as: toilet, changing table, wheelchair, floor, etc.
- E. SUREHANDS Model 2800 series motorized lift/hoist
1. Safe working load - 440lbs/200kg
 2. Batteries - 2 x 12 V 9.5 Ah/rechargeable SLA to ensure maximum number of lifts during the day between charges
 3. Metal gear wheels for durability and longevity, 2 guide wheels and 4 carrying wheels per set.
 4. Motorband length - 78.7 inch / 2 meter, lifting range from floor to above attachment location. Length ensures students can be lifted off the floor or a floor mat.

- Safety factor = 10
5. Emergency down feature - mechanical, *does not require a technician to function
 6. Hand control
 - watertight IP67 electric with Up/Down controls
 - magnetic to aid caregivers while attending to students
 - length (min 35" with extension to +/- 60") – the long extendable cord enables staff to position themselves in front of or behind the wheelchair or floor mat to maintain "hands on" with the student
 7. Console with touch panel for Up/Down controls
 8. Charger - output 24 Vdc Max 1.3 A
 9. Lateral movement - manual, 12 rollers for smooth movement
 10. Charging pins - Wago push terminal block to prevent a short from occurring in the charging assembly
 11. LED indications
 - Battery indications - denoting charging taking place, low battery, battery sufficiently charged
 - On/Off indications
 12. Protection against moisture build up - SureHands 2800 Series motors' printed circuit boards contain protective plastic coating to avoid corrosion (Servisol Plastic Seal 60). Special reservoir to collect condensation.
 13. 360 degree movement when student is hoisted without moving the base - made possible when using the SureHands Model 2125 4-Point Combi-Spreader Bar with attached side bars
 14. Usable Life Span – 15 years, on the condition of correct use and maintenance with yearly inspections.

F. SUREHANDS Slings

1. Sling testing details - a prototype of each sling style are tested
 - Industrial Wash Test - The sling is washed 10 times in an industrial washing machine, following the washing instructions on the sling label. After the tenth wash the sling is reviewed in accordance with our yearly inspection, which requires a complete review of the entire sling for quality and safety.
 - Endurance Test - The same sling that passed the industrial wash test will then be tested 30,000 times with a 770-pound weight. The thirty thousand tests are conducted with a 770-pound human form manikin in four different sling positions.
 - 7,500 tests in a seated position (shortest loop for the shoulders, longest loop for the legs)

- 7,500 tests in a semi-seated position (second shortest loop for the shoulders, longest loop for the legs)
 - 7,500 tests in a semi-recumbent position (longest loop for the shoulders, second shortest loop for the legs)
 - 7,500 tests in a lying position (longest loop for the shoulders, shortest loop for the legs)
 - After completion all 30,000 tests with the 770-pound manikin the sling is then reviewed again in accordance with our yearly inspection checklist.
 - Destructive Load Test - Each type of sling is gradually tested to a maximum weight of over 2,865 pounds to see if the sling can be broken. Though we are unsuccessful in breaking most slings with the weight of 1.43 tons, the research and development team learns a great amount from this testing, which we apply to further advances and developments with our slings.
2. General Details
- Red Safety Stitching - red safety stitching is located on the shoulder loops of SureHands slings. The red stitching is very visible making it easier to monitor the condition of the sling loops for safety purposes.
 - Color coded sizing - the loop on the back of the SureHands sling is color coded to indicate it's size.
3. *SUREHANDS Model 3431 Contour Sling, padded legs, head support, 4 straps, mesh fabric for use in pool.
- 6.89"-9.25" wide leg flaps with grey nylon mesh material which assists in keeping them from bunching up under legs for a more comfortable and less abrasive lift.
4. *SUREHANDS Model 3445 Contour Sling, padded legs, head support, 4 straps, Daylite material.
- 6.89"-9.25" Parachute quality, nylon moisture wicking material, smooth texture with flat seams to help avoid skin irritations, especially for students that experience pressure sores and other skin related maladies. Designed to remain under/behind the student all day. Assists in keeping them from bunching up under legs for a more comfortable and less abrasive lift.
- G. SUREHANDS Model 2125 4-Point Combi-Spreader Bar with attached side bars
1. 4-point connections for SUREHANDS Slings with attached side bars to enable lifting of orthopedically involved students and to provide comfort
 2. Equipped with built-in magnets for hanging the SUREHANDS electric hand controls
 3. 360 degree rotation for flexibility during transfers
 4. Removable
- H. SUREHANDS Model 1640 Mobile Lift
1. Accommodates both SUREHANDS Slings and Model 2125 4-Point Combi-Spreader Bar

2. Emergency down feature - mechanical, *does not require a technician to function
 3. Lifting capacity - 386lbs/175kg
 4. Batteries - 2 x 12 Vdc, 6.5-7.5 Ah
 5. Charger - input: 0.9 A 100-240 Vac 50-60 Hz, class II. Output: 24 Vdc Max 1.3 A
 6. Turning radius - 53.94 inches/137 cm
 7. Width Adjustable Base - max width - 50.2 inches/127.5 cm
 8. Low profile base (4.3 inches/11 cm) - clearance under low objects and changing table frames
 9. Lifting range - from floor up to 82 inches/208.5 cm
 - Extended range to allow lifting students from the floor or therapy mat onto a high changing table and for assisting with standing and ambulation where indicated.
 10. Hand control - watertight IP67 electric
 11. Extra long curved boom arm (~48") gives staff ability to be hands on with student by not having to reach around the mast of the lifter
 12. 360 degree movement when student is hoisted without moving the base - made possible when using the SUREHANDS Model 2125 4-Point Combi-Spreader Bar with attached side bars.
- I. Work described in this section includes providing equipment, incidental material and labor required for complete, operable transfer lift installation. Lifts shall be erected, installed, adjusted, tested and placed in operation by lift system manufacturer, or manufacturer's authorized installer.
 - J. The following preparatory work to receive the lifts specified in this section is part of the work of other sections.
 1. Permanent 120 VAC, 15 amp single phase power to charge the lift at the designated charging point. Check local codes for dedication requirements. GFCI recommended in commercial settings and required in wet environments
 2. Provide structural engineer (by other) approved supporting structure for track installation.

2.3 CHANGING TABLES

- A. Basis-of-Design: Armedica AM-SX 1072, 6 feet long with 37" vertical travel capability.
 1. Foot-switch control
 2. Swivel locking casters
 3. 34 oz vinyl cover with antimicrobial/antibacterial protection
 4. Moves smoothly up and down with no horizontal travel
 5. Side rails that pivot down for easy patient transfer and access
 6. Provide 6" high raised base
- B. Provide one changing table at the following locations:

1. Each Classroom (base bid and alternate)
2. Each Classroom Toilet Room (base bid and alternate)
3. Nurse Office 202
4. Aquatics 400 (provide 3 changing tables)
5. Girls Locker Room 402
6. Boys Locker Room 403
7. Family Toilet 900B

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 CEILING-MOUNTED PATIENT-LIFT SYSTEMS

- A. Install tracks level and plumb, according to manufacturer's written instructions.
 1. Support track directly from structure and/or overhead supplementary framing as required by field conditions using manufacturer's standard supports, anchors, and fasteners at intervals required by lifting capacity indicated, but not less than 48 inches o.c.
 2. Brace direct-to-structure track supports where distance between suspended ceiling and anchors is more than 18 inches.
 3. Trained employees of the authorized installer shall perform installation work.
 4. Provide supports at each track end, splice, and tangent point of each corner.
 5. Install track accessories, splices, end caps, connectors, coupling and joining devices, and other accessories as required for a secure and operational installation.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: For patient-bed service walls, perform periodic installation inspections to ensure that products are installed according to manufacturer's written instructions.
 1. Installation Inspections: Inspect product installations when installation work is 25, 60, and 100 percent complete.
 2. Installation Inspection Reports: Indicate if product installations comply with manufacturer's written instructions and corrective actions required if any.

3.4 ADJUSTING

- A. Adjust products for proper function and operation to comply with manufacturer's written instructions. Clean unit thoroughly.
- B. Instruct users in operating procedures and owner's maintenance person in trouble-shooting and maintenance procedures. Train staff on proper lifting techniques and use of specified slings.

3.5 PROTECTION

- A. Protect installed products from damage for the remainder of the construction period.
- B. Repair damaged products according to manufacturer's written instructions. If damaged products cannot be successfully repaired, as determined by Architect, remove and replace damaged products.

- END OF SECTION 11 73 00 -

**SECTION 11 95 13
KILNS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Kilns.
 - 2. Kiln storage.
- B. Related Requirements:
 - 1. Division 23 for connection of kiln vent.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include diagrams for service connections and power, control wiring, and ductwork.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For products to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Pack and ship to avoid damage according to manufacturer's recommendations.
 - 1. Finish and assemble components in factory before shipment.
 - 2. Ship components in individual, sealed, labeled cartons.
 - 3. Deliver components to room designated for installation.
- B. Do not accept or install damaged products at the site.
- C. Store products in heated, indoor storage near point of installation. Retain protective packaging until installation.

1.6 PROJECT CONDITIONS

- A. Environmental requirements: Do not install until all mortar-, moisture-, and dust-producing work is complete and space has been cleaned.

1.7 WARRANTY

- A. Provide manufacturer's written warranty that products that fail in materials or workmanship shall be replaced after written notice from Owner.
 - 1. Duration: Two (2) years.

PART 2 - PRODUCTS

2.1 KILN

- A. Basis-of-Design: Subject to compliance with requirements, provide American Art Clay Co., Inc. (AMACO); EX-1099SF Kiln with EZ-Lift or a comparable product by one of the following:
 - 1. Paragon Industries, Inc.
 - 2. Skutt.
- B. Description: Top-loading, floor kiln with integral computer controller.
- C. Firing Temperature: Cone 10.
- D. Firing Chamber Size: 28 inches diameter by 27 inches deep.
- E. Power Requirements: 208 V, 3 phase, 46.7 A.
- F. Accessories:
 - 1. Manufacturer's standard downdraft kiln vent kit, with 4 inch diameter duct connection.
 - a. Basis-of-Design: AMACO KilnVent.
 - 2. Furniture Kit: Manufacturer's standard furniture kit for kiln, including shelf supports of various sizes, shelves, and shelf cleaner.
 - a. Basis-of-Design: AMACO FK-399/1099, Cone 10.
 - b. Shelf supports, 1-inch by 1-inch by 1-inch: Nine.
 - c. Shelf supports, 1-inch by 1-inch by 2-inch: Nine.
 - d. Shelf supports, 1-inch by 1-inch by 4-inch: Nine.
 - e. Shelf supports, 1-inch by 1-inch by 6-inch: Nine.
 - f. Shelf supports, 1-inch by 1-inch by 8-inch: Nine.
 - g. Shelf supports, 1-1/2-inch by 1-1/2-inch by 10-inch: Nine.
 - h. Half-octagonal shelves, 26-inches by 13 inches by 1 inch: Eight.
 - i. Kiln shelf wash, 4-pound box.
 - 3. Kiln safety screen: Foldable aluminum frame with fire-resistant curtain with printed warning message.

- a. Basis-of-Design: Dick BLICK #30201-1003.

2.2 KILN STORAGE

- A. Clay Damp Cabinet: Gasketed, metal cabinet for storage of damp clay.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide Debcor; Model 9150 Small Damp Cabinet or a comparable product.
 - 2. Size: 36 inches wide by 19 inches deep by 31 inches high.
- B. Clay Drying Cabinet: Steel cabinet with open mesh paneled doors and perforated shelving for drying and storage of clay.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide Debcor; Model 9150 Small Damp Cabinet or a comparable product.
 - 2. Size: 36 inches wide by 19 inches deep by 31 inches high.
- C. Kiln Cart: Steel framed cart with three heat-resistant shelves for storage of hot kiln furniture and clay.
 - 1. Basis-of-Design: Subject to compliance with requirements, provide Debcor; Model 9500 Heat-Proof Kiln Cart or a comparable product.
 - 2. Size: 16 inches wide by 30 inches deep by 32 inches high.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install kilns, vents, and kiln storage according to manufacturer's written instructions.
- B. Securely anchor stacked kiln storage cabinets to wall with blocking, with hairline gap and fill gap between cabinets with clear silicone sealant.
- C. Remove all packaging and construction debris.

3.3 ADJUSTING

- A. Adjust products for proper function and operation to comply with manufacturer's written instructions.

3.4 PROTECTION

- A. Protect installed products from damage for the remainder of the construction period.
- B. Repair damaged products according to manufacturer's written instructions. If damaged products cannot be successfully repaired, as determined by Architect, remove and replace damaged products.

END OF SECTION 11 95 13

SECTION 12 24 13
WINDOW ROLLER SHADE SYSTEMS

PART I - GENERAL

1.1 SUMMARY

- A. This Section includes manual room darkening roller shades.
 - 1. Provide shades at all exterior windows unless otherwise noted.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content blinds/ shades: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. MR Credit 4: BPDO – Material Ingredients
 - a. For blinds/ shades, if available: Material Ingredient Report.
- C. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
- C. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
 - 2. For the following products:
 - a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
 - b. Fascia: Full-size unit, not less than 12 inches long.
- E. Product Certificates: For each type of roller shade, signed by product manufacturer.
- F. Qualification Data: For Installer.
- G. Product Test Reports: For each type of roller shade.
- H. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations:
 - 1. Obtain roller shades through one source from a single manufacturer.
- C. 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.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name and location of installation.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Store, handle, protect and install absorptive materials, including fabrics materials, in accordance with the Construction IAQ Management Plan required by Division 1 specifications.
- C. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of the construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

- A. Installation: Provide roller shade installer's warranty that installation shall be free of defects for a period of not less than 1 year.
- B. In the event of a warranted product failure, the roller shade installer will, at no cost to Owner, facilitate acquisition and delivery of all necessary components to the Owner. Owner will provide roller shade dealer/installer with direct access to the work, during dealer/installer's normal business hours.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed, or portion thereof.

PART 2 PRODUCTS

2.1 ROLLER SHADES

- A. Recycled Content: Provide products with recycled content.
- B. Basis-of-Design Products:
 - 1. Roller Shades: Subject to compliance with requirements, provide MechoShade by MechoShade Systems or equivalent products by Draper or Lutron.
- C. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 - 2. Shade band and Shade Roller Attachment.
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
- D. Access and Material Requirements:
 - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
 - 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 - 3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.
- E. Shade Brackets: Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
- F. Manual Shade Bracket: Mecho/5.
- G. Fascia: Provide at all locations.
 - 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
 - 2. Fascia shall be able to be installed across two or more shade bands in one piece.
 - 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
 - 4. Provide bracket /fascia end caps where mounting conditions expose outside of roller shade brackets.
- H. Mounting: Wall extension brackets mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

2.2 ROLLER SHADE FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

- B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:
 - 1. Concealed hem tube (Translucent Shades).
- C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

2.3 MANUAL OPERATED CHAIN DRIVE HARDWARE AND BRACKETS

- A. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
- B. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
- C. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
- D. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
- E. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
- F. Drive Bracket / Brake Assembly:
 - 1. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - 2. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- G. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.4 SHADE CLOTH

- A. Translucent Single-Fabric Shadecloth: MechoShade Systems, Inc., EcoVeil group, 100 percent thermoplastic olefin.
 - 1. Shading:
 - a. Roller Shades: EcoVeil "1350 Series", 5 percent open.
- B. Color: Selected from manufacturer's standard colors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

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

- END OF SECTION 12 24 13 -

SECTION 12 32 16

MANUFACTURED CASEWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Provide all plastic laminate casework and accessory items as specified herein. Refer to plans for specific details and requirements. See Alternates.
- B. General Conditions: The General Conditions, Supplementary General Conditions, Special Conditions, and General Requirements apply to all work in this Division.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 74 19 – Construction Waste Management and Disposal.
- B. Section 01 81 13 – Sustainable Design Requirements.
- C. Section 06 10 53 – Miscellaneous Rough Carpentry: Blocking within walls.
- D. Section 08 71 00 – Finish Hardware: Locks master keyed to room doors and other special locks.
- E. Section 09 65 13 – Resilient Base and Accessories: Rubber, vinyl or other finished toe base and resilient flooring.
- F. Division 22, 23 - Mechanical: Sinks, faucets, fittings, traps, stops, tail pieces, vacuum breakers, and other fixtures, electrical and mechanical runs and connections.
- G. Division 26 - Electrical: Fixture installation/services connections: Setting and installation of equipment and fixtures, and related utility connections, are provided under the other sections of the Project Specification governing that utility.

1.03 REFERENCES

- A. ADA (ADAAG): Americans with Disabilities Act Accessibility Guidelines.
- B. ANSI 208.1: Standards for Particleboard.
- C. Architectural Woodwork Institute (AWI): Quality Standards.
- D. NEMA LD 3: High Pressure Decorative Laminates.

1.04 SUBMITTALS

- A. Submit in accordance with Division 1.
- B. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For composite wood, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials

- a. For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.
- 3. MR Credit 4: BPDO – Material Ingredients
 - a. For composite wood, if available: Material Ingredient Report.
 - b. For plastic laminate, if available: Material Ingredient Report.
- 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
- C. Product Data - Manufacturer's data sheets on each product to be used, including:
 - 1. Test reports certifying that the casework finish complies with manufacturer's standards for chemical and physical resistance performance requirements.
 - 2. Performance test reports from an independent testing lab on each specified top material.
 - 3. Preparation instructions and recommendations.
 - 4. Storage and handling requirements and recommendations.
 - 5. Installation methods.
- D. Shop Drawings: Submit shop drawings for approval in the form of one reproducible sepia and one print. Show materials, dimensions, cabinet-cut details, and sink locations. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate locations of blocking and reinforcements required for installing casework.
 - 2. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other equipment.
 - 3. Include coordinated dimensions for equipment specified in other Sections or provided by Owner.
- E. Samples of colors shall be submitted upon award of contract for selection and coordination with other suppliers. For each finish product specified, one complete set of color chips representing manufacturer's full range of available colors and patterns should be submitted. Architect may request and retain samples and catalog cuts as required for accessory and special items.
- F. Full Sized Sample: Submit full size sample of typical cabinet (sample may be incorporated into final work if in good condition). Owner has right to take one cabinet unit (selected at random) off-site for destructive testing. Contractor is to replace this unit at no extra cost to the Owner.
- G. Submit MSDS for any applicable products used.

1.05 QUALIFICATIONS

- A. Drawings and specifications are based upon casework as manufactured by Stevens. See list of other approved manufacturers below.
- B. Substitutions per Division 1 requirements and conditions below. Casework must conform to design, quality of materials, design intent, workmanship and exact performance function of casework components and details specified and implied by manufacturer's reference, and as shown on plans regardless of that manufacturer's "product standards". Full-sized samples, catalogs, and specifications shall be submitted with written request along with detailed list of compliance and deviations from these documents for approval. Samples may be impounded by Owner and retained until completion of job for verification and compliance of specifications.
- C. Manufacturer Qualifications: Not less than 5 years experience in the actual production of specified products. If requested by Architect, submit documentation of plant facilities and capacity to provide casework for this Project.
- D. Installer Qualifications: Firm with 5 years experience in installation or application of systems similar in complexity to those required for this Project, plus the following.
 - 1. Authorized distributor of manufacturer.
- E. In addition to the above requirements, manufacturers requesting approval shall, at the same time, submit certified product test data in accordance with ANSI A161.1-1980, NEMA LD3-1995, and general static load testing performed and certified by an independent testing agency, covering the following areas of product performance, with these minimum results:
 - 1. Base cabinet construction/racking test: 800 lbs. (363 kg)
 - 2. Cabinet front joint loading test: 425 lbs. (193 kg)
 - 3. Wall cabinet static load test: 2,000 lbs. (907 kg)
 - 4. Drawer front joint loading test: 600 lbs. (272 kg)
 - 5. Drawer construction/static load test: 750 lbs. (340 kg)
 - 6. Cabinet adjustable shelf support device/static load test: 300 lbs. (136 kg)

1.06 ACCEPTABLE MANUFACTURES

- A. Stevens
- B. Case
- C. Counterspace, Inc.
- D. General Casework
- E. Paragon
- F. Polyvision
- G. Potomac Architectural Millwork
- H. Southside
- I. TMI

1.07 WARRANTY

- A. Warrant all components of the casework system against defects in material and workmanship for at least five years from date of Substantial Completion.

1.08 Quality Assurance

- A. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.

Part 2 PRODUCTS

2.01 MATERIALS

A. Laminated Plastics/Finishes:

1. High-pressure plastic laminate, .028 inch (.71 mm) in thickness, for exterior cabinet surfaces and interior surfaces of open units, shall meet NEMA LD3-2000 VGS standards.

Exterior Color Selection Available:

- a. Standard finish vertical surface laminate from casework manufacturer's standard stock colors consisting of wood grain patterns and solid colors. Minimum of 200 selections available.
 - b. Provide a total of 4 different colors. Colors to be selected and locations for use of each color identified by the architect during the submittal process.
 - c. Direction of wood grain shall be vertical on door, end panels, fascia panels, and exposed backs; horizontal on drawer faces, aprons, and top rails.
2. Plastic Laminate Balancing Sheet: White high-pressure cabinet-liner, .020 inch (.51 mm) in thickness shall meet NEMA LD3-2000 CLS standards. Use for balancing exterior surface laminates.
 3. Pressure Fused Laminate:
 - a. Melamine resin impregnated, 85 gram PSM minimum, thermofused to core under pressure.
 - b. Shall meet NEMA LD3-2000 VGS standards and NEMA LD3-2000 CLS standards.
 - c. White pressure fused laminate for cabinet interiors behind door and drawers, and underside of wall cabinets.
 - d. Shall be balanced at all concealed surfaces with same thermofused melamine. Unsurfaced coreboard or simple backers not allowed.

B. High Performance Particle Board Core:

1. Particleboard shall be 47 psf density and conform to ANSI A208.1, Grade M-3. Balanced 3-ply construction with moisture content not to exceed 8%. All particle boards shall meet or exceed the requirements for its type and classification under Commercial Standards CS-236-66, Federal Specification LLL-B-800A and ASTM D 1037-78.

Recycled Content: Provide particleboard and MDF with minimum 80 percent recycled content.

2. ANSI 208.2-2002 Grade 130-MR50 MDF moisture resistance standards.

3. TVOC emission factors that are non-detectable after 48 hours per ASTM D 5116-97.
4. Meet following performance requirements:
 - a. Screw holding, face 225 lbs.
 - b. Screw holding, edge 200 lbs.
 - c. Modulus of Rupture 2,400 psi
 - d. Modulus of Elasticity 45,000 psi
 - e. Internal Bond 60 psi
 - f. Surface Hardness 900 psi
6. Composite wood installed within the building interior: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
7. Cabinet components shall be of the following minimum core thicknesses:
 - a. 1/2 inch (12.7 mm): cabinet backs, drawer body, and drawer bottoms.
 - b. 3/4 inch (19.1 mm): door and drawer face, base, wall, and tall cabinet tops and bottoms, cabinet sides, drawer spreaders, cabinet back rear hang-strips, structural dividers, exposed cabinet backs, and shelves in cabinets.
 - c. 1 inch (25.4 mm): product-specific work surfaces and library stack shelving unless stack fitted with vertical divider.
- C. Edging types. Provide one or more of the following in accordance with Item D, below:
 1. FlatEdge PVC. .020 inch (.51 mm). Solid, high-impact, purified, color-thru, acid resistant PVC edging machine-applied with hot melt adhesives, automatically trimmed face, back and corners for uniform appearance. Manufacturer's option of .030 inch (.76 mm) high-pressure plastic laminate if PVC match is unavailable.
 2. 3 mm thick PVC. Solid, high-impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.
- D. Flush Design Edging Locations. Provide the above specified edging types at the following locations, of the following colors:
 1. Door/Drawer-Front edging shall be 3mm PVC - one color as selected from manufacturer's 30 standard colors, color-matched to manufacturer's standard laminates.
 2. Forward edge of cabinet end panel, top, bottom, door/drawer front spacer rail, interior dividers, and shelf shall be 3mm PVC - one color as selected from manufacturer's 30 standard colors, color-matched to manufacturer's standard laminates.

3. Top of drawer body shall be FlatEdge PVC White.

E. Hardware

1. Hinges
 - a. Heavy duty, five knuckle 2 1/2 inch (69.9 mm) institutional type hinge shall meet ANSI/BHMA A156.9 Grade 1 requirements. Mill ground, hospital tip, Teflon coated tight pin feature with all edges eased. Hinge shall be full wrap around type of tempered steel .095 inch (2.4 mm) thick. Each hinge shall have minimum of 7 screws, #8, 5/8 inch (15.9 mm) FHMS to assure positive door attachment.
 - b. One pair per door to 48 inch (1219 mm) height. One and one-half pair over 48 inches (1219 mm) in height. Hinge shall accommodate 13/16 inch (20.6 mm) thick laminated door and allow 270 degree swing.
 - c. Finish shall be LH-301 ChromeCoat powder finish.
2. Pulls: Pull design shall be in compliance with ADA requirements.
 - a. Wire design, LH-321, 4 inches (101.6 mm), in satin chrome finish.
3. Drawer Slides: Dynamic (operational) load rating shall be minimum 100 lbs. (45 kg) unless otherwise noted. Minimum 150 lbs. (68 kg) static load rating.
 - a. Standard Drawers: LSI Lab Series Slide, LH-375, self-closing design, epoxy powder coated White, with positive in-stop, out-stop, and out-keeper to maintain drawer in 80% open position. Captive nylon rollers, front and rear. Minimum 150 lbs per pair dynamic load rating at 50,000 cycles.
 - b. File Drawers and Paper Storage Drawers: Full extension, 3-part progressive opening slide, minimum 100 lb (45 kg), zinc plated or epoxy coated at manufacturer's option.

At File Drawers, provide body mounted molded rails for hanging file system for legal or letter size as indicated. Cutting or machining of drawer body/face not allowed.
4. Catches: Catch shall provide opening resistance in compliance with the Americans with Disabilities Act.
 - a. Provide one top-mounted magnetic catch for base and wall cabinet door. Provide two at each tall cabinet door. Catch housing shall be molded in White. LH-340ADA.
 - b. LH-345 Roller catch for mobile cabinets.
5. Adjustable Shelf Supports: Shall be LH-354 twin pin design with anti tip-up shelf restraints for both 3/4 inch (19.1 mm) and 1 inch (25.4 mm) shelves. Design shall include keel to retard shelf slide-off, and slot for ability to mechanically attach shelf to clip. Load rating shall be minimum 300 lbs. (136 kg) each support without failure. Cabinet interior sides shall be flush, without shelf system permanent projection.
6. Wardrobe Rod: Shall be 1 1/6 inch (27 mm) rod, LH-362, supported by LH-363 flanges.

7. Coat Hooks:
 - a. Single coat hooks, wall mount - LH-365 Satin Aluminum.
 - b. Double coat hooks, wall mount - LH-366 Satin Aluminum.
8. Locks: Shall be disc tumbler lock keyed alike and master keyed. Dull chrome finish.
 - a. Hinged doors and drawers National Lock No. M4-7054.
 - b. 1/4 inch (6.4 mm) sliding panel doors, National Lock No. M2-0225.
9. Casters; shall be 5 inch heavy duty steel rubber tired casters with brakes at corners of designated units. If unit width exceeds 3'-0", provide additional casters at 3'-0" o.c. maximum. Install weld pans at underside of units for caster reinforcement

F. Adhesives and sealants:

1. Interior wet-applied adhesives, sealants, and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
2. Field-applied adhesives and sealants shall meet testing and product requirements of California Department of Health Services Standard Practice for The Testing Of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

2.02 CABINET CONSTRUCTION

A. Fabrication:

1. Exposed exterior cabinet surfaces shall be .028 inch (.71 mm) high-pressure laminate. Laminate surface/balancing liner to core under controlled conditions by approved and regulated laminating methods to assure a premium lamination. Natural-setting hybrid P.V.A. Type III water resistant adhesives that cure through chemical reaction, containing no health or environmentally hazardous ingredients, shall be used.
 - a. Methods requiring heat are not allowed.
 - b. "Contact" methods of laminating are not allowed.
2. Cabinet parts shall be accurately machined and bored for premium grade quality joinery construction utilizing automatic machinery to insure consistent sizing of modular components. End panels shall be doweled to receive bottom and top.
3. Back panel shall be fully bound (dadoed) into, and recessed 7/8 inch (22.2 mm) from the back of cabinet sides, top, and bottom to insure rigidity and a fully closed cabinet. Cabinet back shall be mechanically fastened from rear of body for tight interior fit and sealed with full-perimeter high-strength hot-melt adhesive.
4. Drawer bottom shall be fully bound (dadoed) and glued into and recessed 1/2 inch (12.7 mm) up from the bottom of sides, back, and sub-front. Sides of drawer shall be doweled to receive drawer back and sub-front.
5. 3/4 inch (19.1 mm) thick hang rails shall be mechanically fastened to end panels of all wall, base, and tall cabinets for extra rigidity and to facilitate installation.

6. All cases shall be square, plumb, and true.
 7. Provide removable back panels and closure panels for plumbing access at sink cabinets, and where required.
- B. Detailed Requirements For Cabinet Construction:
1. Sub-Base:
 - a. Cabinet sub-base shall be separate and continuous water resistant exterior grade plywood with concealed fastening to cabinet bottom. Ladder-type jobsite construction of individual front, back, and intermediates, to form a secure and level platform to which cabinets attach. No cabinet sides-to-floor will be allowed.
 - b. Sub-base at exposed cabinet end panels shall be recessed 1/4 inch (6.4 mm) from face of finished end, for flush installation of finished base material by other trades.
 2. Structural Cabinet Body:
 - a. Cabinet parts shall be accurately machined and bored for premium grade quality joinery construction utilizing automatic machinery to ensure consistent sizing of modular components. Dowel end panels to receive bottom and top.
 - b. Cabinets over 36 inches (914 mm) wide shall be furnished with a mechanically fastened, yet removable, vertical divider to reduce horizontal member/shelf deflection. Wall cabinets shall have a clear inside nominal depth of 12 inches (305 mm) unless detailed otherwise.
 3. Cabinet Top and Bottom:
 - a. Solid sub-top shall be furnished for all base and tall cabinets.
 - b. At cabinets over 36 inches (914 mm), bottoms and tops shall be mechanically joined by a fixed divider.
 - c. Exterior exposed wall cabinet bottoms shall be Pressure Fused white laminate both sides. Assembly devices shall be concealed on bottom side of wall cabinets.
 4. Cabinet Ends:
 - a. Holes drilled for adjustable shelves 1-1/4 inches (32 mm) on center.
 - b. Exposed exterior cabinet ends shall be laminated with high-pressure plastic laminate, balanced with high-pressure cabinet-liner interior surface.
 5. Fixed and Adjustable Shelves:
 - a. Thickness shall be 3/4 inch (19.1 mm).
 - b. Shelves shall meet the loading/deflection standards of the National Particleboard Association.
 6. Cabinet Backs:

- a. Cabinet backs shall be minimum 1/2 inch (12.7 mm) thick, inset from rear of body, and fully bound (dadoed) four sides. Rear, unexposed, side of back perimeter shall be toe-nailed with mechanical fasteners for tight interior fit and direct connection of back panel to body, and sealed with full-perimeter high-strength hot-melt adhesive.
- b. Provide 3/4 inch (19 mm) thick hang rails fastened to back/body as specified in this Section. Hang rails shall be located at rear of cabinet back and fastened to cabinet sides. Provide minimum of 2 at base, 2 at wall, and 3 at tall cabinets.
- c. Exposed exterior backs shall be high-pressure plastic laminate balanced with high-pressure cabinet-liner.

7. Door and Drawer Fronts:

- a. Flush Design: Laminated door and drawer fronts shall be 13/16 inch (20.6 mm) thick for all hinged and sliding doors. Drawer fronts and hinged doors shall inset between extended cabinet end panels. Maintain a nominal 3/32 inch (2.38 mm) reveal between pairs of doors, between door and end panel (route for hinge as required), or between multiple drawer fronts within the cabinet.
- b. Front Rail: Provide minimum 3/4 inch (19.1 mm) by 6 inches (152 mm) by full width cabinet body rails immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, close off reveal, and be locator for lock strikes.

8. Drawers:

- a. Drawer fronts shall be applied to separate drawer body component sub-front.
- b. Drawer sides shall be doweled and glued to receive front and back, machine squared and held under pressure to set.
- c. Typical 1/2 inch (12.7 mm) drawer bottom, recessed, shall be fully bound (dadoed) into front, sides, and back. Routing, in drawer body for bottom, shall receive continuous glue.
- d. Reinforce drawer bottoms with 1/2 inch (12.7 mm) by 4 inches (101.6 mm) front-to-back intermediate underbody stiffeners, mechanically fastened. One at 24 inches (610 mm), two at 36 inches (914 mm), and over.
- e. Paper storage drawers shall be fitted with full width hood at back.

9. Vertical and Horizontal Dividers:

- a. Pressure Fused laminate 3/4 inch (19.1 mm) thickness. Sub-dividers secured in cabinet with molded plastic clips or dowels.

2.03 COUNTERTOP CONSTRUCTION

A. Solid Surface Countertops:

- 1. Solid surface shall be Corian, Formica, or Wilsonart.
- 2. Solid surfacing material shall be 1/2" thick minimum with solid MDF underlayment.

3. Back and side splashes shall be four inches high.

4. Front edges shall be half bullnose edge

2.04 STEEL FABRICATIONS, ASSEMBLIES, AND SUPPORT DEVICES

- A. Provide, of the size and configuration as detailed, or as indicated by product number. Exposed welds shall be ground smooth. Finish shall be Black Powder Coat.

2.05 SPECIAL REQUIREMENTS

- A. ADA, Americans with Disabilities Act Requirements: The following special requirements shall be met, where specifically indicated on architectural plans as "ADA", or by General Note. Shall be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations:
1. Countertop height: With or without cabinet below, not to exceed a height of 34 inches (864 mm) A.F.F., (Above Finished Floor), at a surface depth of 24 inches (610 mm).
 2. Kneespace clearance at sinks:
 - a. Adult use: Shall be minimum 27 inches (685 mm) A.F.F. at apron, 19 inches (485 mm) deep, and 30 inches (762 mm) clear span width.
 3. 12 inch (305 mm) deep shelving, adjustable or fixed: Not to exceed a range from 9 inches (229 mm) A.F.F. to 54 inches (1372 mm) A.F.F.
 4. Wardrobe cabinets: Shall be furnished with rod/shelf adjustable to 48 inches (1219 mm) A.F.F. at a maximum 21 inch (533 mm) shelf depth.
 5. Sink cabinet clearances: In addition to above, upper kneespace frontal depth shall be no less than 8 inches (203 mm), and lower toe frontal depth shall be no less than 11 inches (279mm), at a point 9 inches (229 mm) A.F.F., and as further described in Volume 56, Section 4.19.

3.00 EXECUTION

3.01 EXAMINATION

- A. Do not store or install casework in facility until concrete, masonry, drywall and plaster work is dry within limits acceptable to the casework manufacturer.
- B. Do not begin installation until substrates have been properly prepared.
1. Walls and openings are plumb, straight and square.
 2. Concrete floors level within 1/8 inch (3 mm) level per 10 foot (3000 mm) run, non-accumulative, when tested with a straight edge in any one direction.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 COORDINATION

- A. Coordinate work of this Section with related work of other Sections as necessary to obtain proper installation of all items, including but not limited to:
 - 1. Fittings, piping, electrical devices, and wiring.
 - 2. Setting bases and flanges of sink and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material.
- B. Verify site dimensions of cabinet locations in building prior to fabrication.

3.03 INSTALLATION

- A. Install casework in accordance with manufacturer's instructions.
 - 1. Workmen: Install casework under the supervision of the manufacturer's representative with factory-trained mechanics certified by manufacturer.
 - 2. Installation of casework shall be plumb, level, true and straight, with no distortions.
 - 3. Use concealed shims as required.
 - 4. Where casework or equipment butts against other finished work, scribe and cut for an accurate fit.
 - 5. Lubricate operating hardware as recommended by the manufacturer.
 - 6. Install all items complete and adjust all moving parts to operate properly.
 - 7. Use fixture attachments for wall mounted components as recommended by the casework manufacturer.
 - 8. Firmly secure cabinet and counter bases to floor using appropriate angles and anchorages.
- B. Install countertop and edge surfaces in one plane with flush hairline. Locate joints only where shown on Shop Drawings.
 - 1. Provide required holes and cutouts for service fittings.
 - 2. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.
 - 3. Provide scribe moldings for closures at junctures of countertop, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
 - 4. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.04 PROTECTION

- A. Casework shall be protected in transit. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes.

- B. Inspect casework for damaged or soiled areas; remove, refinish, and touch-up as required.
- C. Protect installed products until completion of project.
- D. Touch-up, repair or replace damaged products before Substantial Completion.
- E. Remove cartons, debris, sawdust, scraps and similar items and leave spaces clean, and casework ready for Owner's use.
- F. Provide the services of a qualified manufacturer's representative shall demonstrate operation and maintenance procedures of the installed casework and equipment to the Owners personnel.

- END OF SECTION 12 32 16 -

SECTION 12 35 50
MEDIA CENTER CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Casework for Instructional Media Center, including:
 - 1. Book shelving units - wall and free standing
 - 2. Circulation desk cabinets
 - 3. Book truck
 - 4. Display tables
 - 5. Magazine shelving

1.02 RELATED SECTIONS

- A. Section 01 74 19 – Construction Waste Management and Disposal.
- B. Section 01 81 13 – Sustainable Design Requirements.
- C. Section 06 10 53 – Miscellaneous Rough Carpentry.
- D. Section 12 32 16 – Manufactured Plastic-Laminate-Clad Casework

1.03 QUALITY ASSURANCE

- A. Shelving and cabinets to be furnished by same manufacturer to provide a single source of responsibility.
- B. Manufacturer shall have a minimum of five years' experience in manufacturing of wood media center furnishings on a national basis.

1.04 SUBMITTALS

- A. Submit design and installation drawings showing product components in assembly with adjacent materials and products.
- B. Submit manufacturer's certification that composite wood products, agrifiber products and field-applied adhesives and sealants installed in building interior meet testing and product requirements of California Department of Health Services Standard Practice for The Testing Of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
- C. Submit certification of application of borate treatment to woodwork in contact with slab.
- D. Submit MSDS for any applicable products used.
- E. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For composite wood, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For certified wood: Documentation indicating percentage new wood, percentage FSC

and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.

3. MR Credit 4: BPDO – Material Ingredients
 - a. For composite wood, if available: Material Ingredient Report.
4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Pack and ship to avoid damage according to manufacturer's recommendations.
 1. Finish and assemble components in factory before shipment.
 2. Ship components in individual, sealed, labeled cartons.
 3. Deliver components to room designated for installation.
- B. Store products in heated indoor storage new point of installation. Retain protective packaging until installing.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install cabinets until all mortar, wet and dust producing work is completed.
- B. Field Measurements: Verify shelving unit location by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.07 WARRANTY

- A. Provide manufacturer's written warranty that products not in accordance with requirements of Contract Documents within three years after commencement of warranties shall be corrected promptly after receipt of written notice from Owner.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Media Technologies
- B. Russwood
- C. Estey, A Division of Tennsco Corp.
- D. Worden Company, Holland MI.
- E. Substitute products must obtain approval prior to bidding as required under provisions of Instructions to Bidders.

2.02 MATERIALS

- A. Wood Materials, General:
 - 1. Give preference to rapidly renewable agrifiber and/ or recycled content materials.
 - 2. Composite wood: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
- B. Vertical uprights of library shelving shall be a minimum of 1 inch thick, kiln-dried solid oak or maple, glued up in strips no less than 1-1/2 inches and no wider than 4 inches, and free of imperfections.
- C. Canopy cornice shall be constructed of an oak or maple plywood top with solid oak or maple fascia strips which are machine applied to front and back edges. Bolting cleats are attached by means of wood screws and glued construction.
- D. Continuous top shelving will have a 2-1/4 inch deep dovetailed top frame provided with countersunk holes for screwing down a continuous top made of high pressure laminate on 45 pcf core with 1 inch oak edge bands on exposed edges.
- E. Bases shall be of solid oak 3-1/2 inch in height with dovetail joints.
- F. Shelves shall be a minimum of 1 inch thick, edge glued, solid oak or maple strips no less than 1-1/2 inch wide nor wider than 4 inches. The underside of all shelves shall be neatly routed to receive the metal supporting pins or clips.
- G. Shelf height adjustment is accomplished by means of four round metal threaded pins with matching receiver holes utilizing four per shelf on 1-1/4 inch centers. Metal pilaster shelf supports are available as an option.
- H. Shelving units shall have backs of 1/4 inch thick seven ply oak or maple veneer, plain sliced plywood. Back shall be finished on one side for single faced units and on both sides for double faced units.
- I. Lumber: Wood used in construction of furniture and cabinetry shall be of solid oak or maple and shall be selected from seasoned, kiln-dried materials free from structural imperfections. Moisture content at time of fabrication may range from 5 percent to 2 percent. Exterior woods shall be northern oak, selected for uniformity of grain and color. Wood used for internal parts shall be selected as structurally sound.
- J. Casters; shall be 3 inch heavy duty steel rubber tired casters with brakes at corners of designated units. If unit width exceeds 3'-0", provide additional casters at 3'-0" o.c. maximum. Install weld pans at underside of units for caster reinforcement.
- K. Adhesives and sealants and termite treatment:
 - 1. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section, "Sustainable Design Requirements – LEED."
 - a. At minimum, products need to comply with VOC limits specified in LEED-for Schools if alternatives tested to CA protocol are not available.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Subcontractor shall examine work of other trades for acceptability of surfaces for installation. Should there exist conditions that would affect complete and proper installation of casework, Contractor should be notified before start of work.

3.02 INSTALLATION

- A. Installation of wood casework shall be by manufacturer's approved installer.
- B. Shelves abutting walls shall be attached to walls in secure manner in accordance with manufacturer's recommendations and as indicated on drawings.
- C. End panels shall be joined to cornice and base by means of metal ferrules embedded in end panels with 5/16 inch hex head bolts passing through cleats on cornice and sides of base and engaging ferrules.
- D. Additional units shall be joined by means of 5/16 inch hex head bolts passing through both bases and intermediate upright and both cleats on cornices and intermediate upright and secured with washers and nuts.

- E. Shelving units 72 inches high and under have standard continuous top construction. Shelving units above 72 inches high have standard canopy top construction.
- F. Care shall be taken during assembly and installation to prevent damage to casework. Damaged units shall be replaced, by Contractor, at no cost to Owner.
- G. Clean all surfaces of soil and remove all packaging materials and construction debris.

3.03 MEDIA CENTER SHELVING AND CASEWORK SCHEDULE

SH-1

Closed base shelving, single faced, 66" high x 36" wide x 15" deep with (4) adjustable shelves and (1) base shelf, closed back and metal canopy top. Provide (2) 9" high divider per shelf.

SH-2

Closed base shelving, single faced, 66" high x 21" wide x 15" deep with (2) base shelves and (4) adjustable shelves, closed back and metal canopy. Provide (1) 9" high divider per shelf.

SH-3

Closed base shelving, single faced, 66" high x 36" wide x 12" deep with (4) adjustable shelves and (1) base shelf, closed back and metal canopy top. Provide (2) 9" high divider per shelf.

SH-4

Closed base periodical display and storage unit, single faced, 66" high x 36" wide x 12" deep with (3) display shelves and (2) storage shelves, closed back and metal canopy.

SH-5

Closed base mobile shelving unit, double faced, 42" high x 36" wide x 12" deep with (2) storage shelves and (4) display shelves, closed back and metal canopy/HPL counter top.

SH-6

Closed base mobile shelving unit, double faced, 42" high x 72" wide x 12" deep with (2) storage shelves and (4) display shelves, closed back and metal canopy/HPL counter top.

SEP-1

66" high x 15" wide to fit single faced base shelving unit end panel with HPL finish.

SEP-1

66" high x 12" wide to fit single faced base shelving unit end panel with HPL finish.

SEP-3

42" high x 24" wide to fit double faced mobile shelving unit end panel with HPL finish.

CF-1

Corner filler to fit 66" high x 15" deep base shelving unit with metal canopy top.

BR-1

Kingsley EasyRoller Indoor Metal Book Return, 19" wide x 19" deep x 45" high:

<https://www.kingsley.com/indoor-easyroller-metal-rolling-return.html>

- END OF SECTION 12 35 50 -

SECTION 12 36 00

COUNTERTOPS

PART 1: GENERAL

- 1.1 Section Includes:
 - A. Countertops for architectural casework.
 - B. Wall-hung counters and vanity tops.
 - C. Natural Quartz and Resin Composite Window Sills.
- 1.2 Related Sections:
 - A. Section 06 10 53 – Miscellaneous Rough Carpentry
 - B. Section 06 20 00 – Finish Carpentry
 - C. Section 12 32 16 – Manufactured Casework
- 1.3 Reference Standards:
 - A. ANSI A208.2 – Medium Density Fiberboard for Interior Applications; 2009
 - B. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position, 2014
 - C. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2017
 - D. AWI/AWMAC (QSI) – Quality Standard Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed. Version 2.0.
 - E. ISFA 2-01 – Classification and Standards for Solid Surfacing Material; 2013
- 1.4 Submittals:
 - A. See Section 01 33 00 – Submittal Procedures, procedures on submittals
 - B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations
 - 2. Storage handling requirements and recommendations
 - 3. Specimen warranty.
 - C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
 - D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
 - E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
 - F. LEED Submittals: Comply with Section 01 81 13.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - 1. For composite wood, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - 1. For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - 1. For composite wood, if available: Material Ingredient Report.
 - 2. For plastic laminate, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - 1. For interior wet-applied adhesives, sealants, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 and VOC content in g/L. Include volume of material applied per product.
 - 2. For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control

- Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.
- 1.5 Delivery, Storage and Handling:
 - A. Store Products in manufacturer's unopened packaging until ready for installation.
 - B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- 1.6 Field Conditions:
 - A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2: PRODUCTS

- 2.1 Countertop Assemblies
 - A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat sheet thickness: ¼ inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum, when tested in accordance with ASTM E84.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: to be selected from manufacturer's full line.
 - d. Manufacturers:
 - i. Dupont
 - ii. Formica Corporation
 - iii. Avonite Surfaces
 - iv. Wilsonart International Inc.
 - e. Other Components Thickness: ½ inch, minimum
 - f. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
 - g. Skirts: as indicated on drawings.
 - B. Performance/Design Criteria:
 - 1. Tensile Strength: 6000 PSI minimum
 - 2. Tensile Elongation: 0.4% minimum
 - 3. Tensile Modulus: 1.5×10^6 psi min.
 - 4. Thermal Expansion: 2.2×10^{-5} in/in/F
- 2.2 Accessory Materials
 - A. Wood-based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
 - 2. Composite wood installed within the building interior: Contain no urea-formaldehyde resins or comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins.
 - B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum ¾ inch thick; join lengths using metal splines.
 - C. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2_M-2, 47 pcf minimum density; minimum ¾ inch thick; join lengths using metal splines.
 - D. Backer Sheet: Provide substrate with laminate backer sheet.
 - E. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined. No add urea formaldehyde.
 - 1. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Sections "Sustainable Design Requirements – LEED v4 for Schools"
- 2.3 Fabrication

- A. Fabricate tops, splashes and sills in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhand fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue
 - 2. Height 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

- 3.1 Examination
 - A. Do not begin installation until substrates have been properly prepared.
 - B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
 - C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.
- 3.2 Installation
 - A. Securely attached countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
 - B. Attach epoxy resin countertops using compatible adhesive.
 - C. Seal joint between back/end splashes and vertical surfaces.
- 3.3 Tolerances
 - A. Variation from Horizontal: 1/8 inch in 10 feet, maximum.
 - B. Offset from Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
 - C. Field Joints: 1/8 inch wide, maximum.
- 3.4 Cleaning and Protection
 - A. Clean countertop surfaces thoroughly.
 - B. Protect installed products until completion of project.
 - C. Touch-up repair or replace damaged products before Substantial Completion.

- END OF SECTION 12 36 00 -

SECTION 12 48 23
ENTRANCE FLOOR GRIDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following types of entrance flooring systems:

1. Floor Grids & Frame Assemblies

1.2 RELATED SECTIONS

- A. Sections 03 30 00 – Cast-In-Place Concrete
B. Section 04 20 00 – Unit Masonry
C. Section 09 30 00 - Tiling

1.3 SUBMITTALS

- A. General: Submit the following in accordance with conditions of contract and Division 1.
- B. LEED Submittals: Comply with Section 01 81 13.
1. MR Credit 3: BPDO – Sourcing of Raw Materials
- a. For recycled content floor grille: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.
2. MR Credit 4: BPDO – Material Ingredients
- a. For floor system: Material Ingredient Report.
- C. Product data for each type of floor grid and frame specified, including manufacturer's specifications and installation instructions.
- D. Shop drawings in sufficient detail showing layout of grid and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.
- E. Samples for approval: Submit samples of tread insert material.
- F. Samples for verification purposes: Submit an assembled section of floor grid and frame members with selected tread insert showing each type of color for exposed floor grid, frame and accessories required.
- G. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor grids.
- H. Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux, minimum 0.45 watts/m².
- I. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.
- J. Standard rolling load performance is 1000 lb./wheel (load applied to a solid 5" x 2" wide polyurethane wheel, 1000 passes without damage).

- K. Single source responsibility: Obtain floor grids and frames from one source of a single manufacturer.
- L. Utilize superior structural aluminum alloy 6105-T5 for rail components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Construction Specialties, Inc. (Basis-of-Design)
- B. American Floor Products Company, Inc.- Stratoflex III Foot Grid System
- C. Pawling Corporation
- D. Kadee Industries.

2.2 MATERIALS

- A. Aluminum - ASTM B 221, alloy 6105-T5, 6105-T6 for extrusions.
- B. Architectural Bronze Cap - ASTM B 455, copper/zinc alloy C38500 for extrusions.
- C. Flexible and prime PVC extrusions.
- D. Tread insert options - refer to section 2.5.

2.3 FLOOR MATS

- A. Model and Description - G4 PediTred shall be extruded 6105-T5 aluminum alloy with 3/4" deep tread rails joined by a dual durometer PVC combination hinge and cushion to compromise the overall grid length (traffic direction). The hinge shall be complete with perforations between each tread rail for drainage, unless otherwise specified. Rail finish to be standard mill, with anodized finish. Unit must withstand 1000 lb. wheel loads (load applied to a 5" x 2" wide polyurethane wheel, 1000 passes without damage).

2.4 GRID FRAMES

- A. AL - Level Base Frame shall be a 1" deep recessed frame in 6063-T6 aluminum alloy with a 1/4" wide exposed surface. Black or brown vinyl fillers shall be furnished as required, when standard 1 1/2" tread spacing cannot be maintained. Installer shall use recommended latex screed to ensure level base. Frame color shall be supplied in standard mill, with anodized finish. Mill finish frames in contact with concrete to be primer coated.

2.5 TREAD INSERTS

- A. HD – MonoTuft HD™ Carpet shall meet CRI standard for good indoor air quality. Fibers shall include a minimum of 100, 12 mil monofilament fibers per square inch. Available in one of 21 standard colors as offered by manufacturer. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. Anti-static carpet fibers shall contain antimicrobial additive and be treated with Scotchgard® to reduce soiling. Carpet weight shall be 33-oz./yd².

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Manufacturer shall offer assistance and guidance to provide a template of irregular shaped grid assemblies to ensure a proper installation.

3.3 INSTALLATION

- A. Install the work of this section in strict accordance with the manufacturer's recommendations.
- B. Set grid type at height recommended by manufacturer for most effective cleaning action.
- C. Coordinate top of grid surfaces with bottom of doors that swing across to provide ample clearance between door and grid.

3.4 CLEANING

- A. Clean the tread surface and recess well as frequently as possible to reduce the effects of accumulated soiling that may hinder performance and lifetime.

3.5 PROTECTION

- A. After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.
- B. Defer installation of floor grids until time of substantial completion of project.

- END OF SECTION 12 48 23 -

SECTION 13 11 00
SWIMMING POOL - GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Owner has determined that the nature of the proposed swimming pool construction make the requirement for proper and adequate experience of paramount importance. This section of these specifications describes swimming pool construction which must be performed by a specialty contractor, herein refereed to generically as Pool Contractor, who, under their own name, shall be capable of meeting all pool construction qualifications herein stated, and who is an experienced Swimming Pool Contractor specializing in commercial, municipal and/or institutional swimming pool construction and swimming pool equipment installation and service.
- B. All work called for in this specification division shall be and will remain throughout the warranty period, the sole responsibility of a single contractor specializing in the construction of commercial swimming pools and the installation and service of commercial swimming pool equipment.
- C. Experience and construction qualifications must be specific to the Swimming Pool Contractor, not to said Contractor's vendors, sub-subcontractors or employees.
- D. It is the intent of these specifications that the Pool Contractor deliver a complete and operational swimming pool with its associated mechanical support systems. Systems shall include all control valves as hereinafter specified, and all customary or necessary accessories including plumbing components whether or not shown or implied on the drawings. Any item of work or equipment that is obviously a part of the pool construction, the filter system, the water chemistry and/or necessary to their operation but not specifically mentioned herein or on the drawings shall be furnished by this Contractor at no extra cost.

1.02 QUALIFICATIONS OF SWIMMING POOL CONTRACTOR

- A. The Swimming Pool Contractor must have a proven record of competence and experience in the construction of similar institutional facilities. The following requirements have been established to ensure that only properly qualified Contractors will be considered.
- B. Documentation establishing the following minimum experience must be included with the submission:
 - 1. Pool Contractor's certification that it has been continuously engaged for at least ten (10) years in the construction or renovation of the type of swimming pool herein specified.
 - 2. Pool Contractor's project experience listing which shall include as a minimum of ten (10) new, outdoor, commercial pool projects similar to the subject project. Reference projects must have been constructed within 100 miles of the proposed project site and must include a water surface area of not less than 900 sq. ft. At least two of the reference projects must include a stainless-steel perimeter system. Pools shall be new construction, which the Pool Contractor has constructed under its current name and which upon investigation, would be found to have been completed in a satisfactory manner.
- C. Documentation substantiating the prospective subcontractor's compliance with the qualifications noted above must be submitted by the successful bidder for review. The Architect and/or Owner reserve the right to reject any Pool Contractor if the evidence submitted by, or investigation of,

such Contractor fails to satisfy the Architect\Owner that such Contractor is properly qualified to carry out the obligations of the contract and to complete the work described, or if the Contractor does not meet the minimum qualifications stated above and herein.

1.03 SUBSTITUTIONS

- A. It is the intent of these specifications that the base bid shall be based upon furnishing the materials and equipment established as the basis for design. The Consultant and Owner have made a detailed investigation before selecting the specified swimming pool recirculation, filtration, deck, and other special pool equipment. The operation and maintenance of the swimming pool facility, sustainable design attributes, indoor air quality management, the building structural design, the interface of related equipment within the building structure, and governmental approvals specific to this project are predicated upon utilization of the equipment identified as the basis for design.
- B. The materials, products and equipment described in the bidding documents establish a standard of required function, design, appearance and quality to be met by any proposed substitution. Contractors wishing to base their bid upon the use of components or methods of construction other than those specified may refer to other portions of these specifications for product substitution information.
- C. A proposed substitution for the pool's stainless-steel perimeter system **must be approved prior to the bid.**
- D. Bidders who propose substitutions shall be responsible for the design and implementation of any modifications to the pool, to the building, the building foundations or such other component of the overall construction that must be changed to accommodate the proposed substitution. The Consultant/Owner reserve the right to require sealed drawings detailing any such required changes as a prerequisite to their consideration of a proposed substitution.
- E. In the event the Owner shall not accept any proposed substitution, then the Contractor shall be required to furnish the materials specified at no extra cost to the Owner.

1.04 SCOPE OF WORK

- A. By bidding on this project, the Contractor acknowledges that it understands the design intent and that either by virtue of its own experience or in conjunction with qualified subcontractors, it has the knowledge and expertise to complete the project in substantial compliance with the contract documents.
- B. Given its expressed knowledge and understanding of the work involved, Contractor shall provide any component or work necessary for the proper completion and normal operation of the pool whether or not shown or implied on the project drawings.
- C. The Contractor shall provide all labor, material, equipment and services required for installation of all items of work specified herein. It is understood that the intent of the said plans and specifications is to require the Contractor to furnish a pool ready for use.
- D. Water to fill and/or test the pool, and any other pool related items specifically excluded from the work of this section, by these specifications or as noted on the drawings shall be by the Owner or others.
- E. WORK OF THIS SECTION:

In general, the work of this section includes the construction of a therapy pool for use by physically challenged children. The work of this section includes but is not necessarily limited to the following:

1. Review site access and available laydown area prior to commencement of construction.
2. Layout pool with bench mark elevations derived from established site surveys or references.
3. Provide qualified supervision for the pool excavation and placement of the stone subbase.
4. Provide and install all required forms for pool construction.
5. Provide and install the specified pool steel reinforcing.
6. Construct the pool shell of pneumatically-placed concrete in the manner specified.
7. Provide and install the pool filter and recirculation systems as indicated on the drawings or as specified in subsequent sections of these specifications.
8. Supply and install all fixtures or fittings such as overflow gutter, filtered water inlets, bottom outlets and the required process piping to interconnect such in-pool fittings with the filter system. Note that required ductwork beyond the source-capture plenum connection flange is not included in then work of this section.
9. Supply and install any required sleeves and flexible penetration systems for all pipes passing through foundations or walls.
10. Provide and install the specified sanitizing equipment.
11. Provide deck anchorage and equipment, and erect deck accessories as required by these specifications.
12. Provide and install depth or warning markings as noted on project drawings.
13. Provide pool interior finishes consisting of quartz-aggregate pool plaster as indicated in these specifications and/or on the drawings.
14. Provide initial start-up of the pool, balancing of pool water, initial chemical inventory, instructions to the Owner's personnel and written instructions on the proper operation of the pool equipment.
15. Provide shop drawings on construction, equipment layout, equipment anchor instructions.
16. Make application to appropriate Health Department agencies for approval conformance to Health Department regulations specific to the swimming pool, or operating permit/inspection application if required.

F. RELATED AND INTERFACING WORK:

The following related work is not included in the work of this section and may be further defined or specified in other sections of these specifications.

1. All site work, new pool excavation, disposal of excavated material, piles, construction of structural support slabs, and de-watering of excavation as required.
 - a) Furnish, place, and compact 6" minimum layer of $\frac{3}{4}$ " clean stone sub-base on floor of excavation.

- b) Surface water run-off control, grading, backfilling and any other area preparation or site work required prior and subsequent to start of pool construction.
 - c) Furnish and place any backfill material for pool structure, main drain piping, etc., as required.
- 2. All work involving potable, fresh water lines including fresh water service to pool or filter room as required and noted.
- 3. Waste or drainage: The Contractor shall run a discharge pipe from the filter systems to discharge into a backwash holding tank in the pool equipment room as indicated on the plans. The backwash holding tank is not included in the work of this section.
- 4. Deck drains as noted on the project drawings.
- 5. Concrete flatwork, walks, decks, installation of deck graphics or markers, concrete sumps, foundations, and any other work other than construction of the pool as noted on the project drawings and specified in other sections of these specifications.
- 6. All buildings, site structures and related amenities, site repair, concrete work other than pool structure, as may be required and noted on the project.
- 7. Electrical work: All electrical work including grounding of the pool, deck equipment anchorage, and filter room equipment. The Contractor shall provide the solenoid valves, chemical feed equipment, recirculation pumps and motors, variable frequency drives, specialized control panels (specific to pool equipment), and shall mount such equipment. The Pool Contractor shall be responsible for incidental low-voltage (less than 110 volts) control wiring within the filter room. All other power and control wiring, conduits, disconnects, motor controls, power panels and breakers, etc., to make system operational shall be provided by the electrical contractor.

1.05 QUALITY OF MATERIAL

- A. Special attention is directed to the specifications and/or drawings relative to materials and equipment specified in this Division.
- B. Where more than one manufacturer's name is mentioned or the term "or equal" is used, a particular item of equipment or material, the Contractor may base its bid on other manufacturers, but will be subject to Consultant's approval per Instructions to Bidders.

1.06 TESTING

- A. Unless otherwise provided by the owner or owner's representative, the Contractor shall be responsible for the following test procedures in accord with procedures described in ACI 506.2.
 - 1. Pneumatic Concrete Compressive Strength:
 - a) Two (2) test cylinders shall be taken for every 40 yards of concrete placed with a minimum of four taken for each day's shooting and placement.
 - b) Contact certified testing laboratory and advise them to pick up the cylinders on the fourth or fifth day transporting them to their laboratory for curing, and testing in accordance with ACI Standard 506-66, Section 320.
 - c) Submit test results to Consultant before completion of the project.

2. Piping

- a) All pressure supply lines shall be air tested at 20 psi and shall hold the desired pressure for a period of two (2) hours. In case of pressure loss exceeding 1 psi in two (2) hours, all joints shall be checked with a soapy solution to determine if leaking. Leaking joints shall be repaired and the system rechecked until all joints in piping are proven to be satisfactory.
- b) All piping systems normally operated at a static or negative pressure (suction) shall be tested at 10 psi for a period of two (2) hours. In case of pressure loss exceeding 1 psi in two (2) hours, all joints shall be checked and repaired if faulty.
- c) Prepare test report for all buried piping and submit both proposed form and actual test results to consultant.

1.07 CONSTRUCTION TOLERANCES

A. The Contractor shall be responsible for the following tolerances:

1. Pool depth in shallow area - plus 2" minus 1".
2. Pool depth in deep area - plus 2" minus 1".
3. Dimensions: length - plus 1" minus 1",
width - plus 2" minus 1".
4. Vertical walls - plus or minus 1/2" in top 3' 6" feet vertical dimension,
remaining wall down to radius to be within eleven degrees
of vertical.

1.08 WARRANTY & GUARANTEE

A. The following warranties shall apply to all work under this contract specific to the Swimming Pool:

1. One (1) year contractual warranty
 - a) The Contractor shall warrant that all materials used in the completing the installation contracted for are new and of high quality; that all work has been done in a competent and workmanlike manner; that if any substantial defect occurs in the workmanship or materials it will be remedied without cost to the Owner if written notice is given to the Contractor within one (1) year after the performance of such work and within ten (10) days of evidence of the defect. Assemblies or units (such as heaters, pumps and motors, etc.) and standard fittings or accessories purchased by the Contractor for use in this installation are subject only to the extent of the manufacturer's warranty. The foregoing agreement in respect to warranties is in lieu of all other warranties or guarantees, expressed, implied or statutory except Extended Warranties, if called for in the detailed pool specifications.
 - b) The filter manufacturer's standard warranty shall be satisfactory.
 - c) The Carbon Dioxide system shall carry a one (1) year warranty on all components.
 - d) The integrated chemistry controller shall be covered by a standard manufacturer warranty of five (5) years. Special extensions of more limited warranties shall not be considered acceptable. All sensors will be covered by a standard one (1) year warranty. Other parts shall be covered by their own manufacturer's warranty. The

controller shall not require a service technician for annual calibration, seasonal start up, or whenever chemicals supplier or type are changed.

2. Extended Warranties:

a) Pool Structure

The Contractor shall warrant for two (2) full years, the repair of the pneumatic pool structure covering any structural defects, and/or leaking in the pneumatic concrete pool shell caused by defective workmanship or material, exclusive of damages due to sub-surface movement, settlement, or hydrostatic conditions, provided the pool is kept full of water at all times except for the required cleaning and that during such cleaning the pool does not remain entirely empty for more than a forty-eight (48) hour period.

This warranty is void if the pool is not serviced by the Contractor, or by others in strict compliance with the detailed instructions furnished to the Owner by the Contractor.

Tile, coping, deck, colors, interior finishes, plaster, paint, deck equipment, accessories, piping, filter, pumps, chemical feeders, and electronic analyzers are by definition not included as part of the pool structure.

b) Recirculation System:

The Contractor shall warrant repair of any defective material or repair or correction of improper installation on the recirculation system (exclusive of all valves and interconnecting pipe fittings and the filter chamber) due to defective workmanship or materials not caused by deliberate or abusive action by person(s) not employed by the Contractor or attributable to normal wear and usage. This warranty shall remain in force for two (2) years from the date of installation. It is also understood that the entire system must be continuously maintained according to the service procedures and directions issued by the manufacturer and that this warranty does not cover damage to the system or its components caused by corrosive or improper water treatment procedures implemented by persons other than those employed by the Contractor.

This warranty does not cover filter media, elements, pumps, motors or other mechanical equipment furnished by the third parties.

3. Period of Time:

Period of time of guarantee, warranties and/or maintenance bonds, notwithstanding anything contrary in Contract documents, shall commence with and include date of final certificate of payment, date of issuance of temporary or final certificate of occupancy to Owner, or beneficial occupancy, whichever is earliest. Beneficial occupancy in connection with this article is defined as actual use of premises by Owner for purpose intended.

1.09 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for the complete swimming pool system, and for each component and product used in the system. Include certified laboratory test reports on components as specified or required by regulatory agencies.

- B. Shop Drawings: Submit as-built record shop drawings for all buried or imbedded piping. Submit detailed shop drawings of all filter room work if components other than those noted as the basis for design are utilized.
- C. Photographs: Submit representative, record images on CD for all phases of construction specifically including but not limited to buried piping, pressure tests, steel reinforcing and splash pad reservoir.
- D. Maintenance Manuals: Submit two bound maintenance manuals for swimming pool system. Include full maintenance and operating instructions, part lists, recommended splash pad parts and emergency parts inventory, chemical treatment and supply list and recommended stock, sources of purchase and similar information. Provide electronic copy in PDF format.
- E. Refer to section 01300 for quantities of submittal documents and other related information.

1.10 START-UP SERVICES

- A. The Pool Contractor shall start all equipment and ensure that it is operating normally and, in every way, consistent with industry standards before turnover to owner
- B. The Contractor shall supply the services of an experienced swimming pool operator/instructor for not less than three instructional periods to instruct and familiarize Owner's personnel on the use and operation of the pool equipment. The first shall be at project completion, the second shall be in the spring at start-up and the third period shall occur within one month after turnover at the Owner's convenience.
- C. The Pool Contractor shall test the water before the interior finish is applied and shall be prepared to initially balance the water to meet the following parameters;
 - 1. Free chlorine: 1.5 – 2.0 ppm
 - 2. pH 7.4
 - 3. Total Alkalinity: 100 – 125 ppm
 - 4. Calcium Hardness: 150 – 250 ppm
- D. The pool contractor shall utilize Orenda SC-1000 scale and metal control for start-up in the pool in accordance with the manufacturer's instructions. <https://orendatech.com/orenda-products/sc-1000/>
- E. The Pool Contractor shall provide sufficient chlorine in the new chlorine storage tank to initially balance the water, demonstrate that the systems work properly and maintain the chlorine levels until winterization. The Contractor shall be responsible for filling the chlorine tank one time.
- F. Contractor shall coordinate with the owner regarding the timing and requirements for their CO2 system. Provision of CO2 shall be by the owner. Contractor shall not use CO2 for water chemistry balancing.

1.11 PATENTED MATERIALS

- A. The Contractor shall pay all royalties and license fees. The Contractor shall also defend all suits or claims for infringement of any patent rights and shall save the Owner, Consultant and/or Owner's Representative harmless from loss on account thereof. Except that the Contractor shall not be responsible for all such loss when a particular manufacturer or manufacturers is specified, but if the Contractor has reason to believe that the design, process or product

specified is an infringement of a patent. The Contractor shall be responsible for such loss unless he promptly gives such information to the Owner, Consultant and/or Owner's Representative.

1.12 CODES

- A. All work in this division shall be according to all applicable Local, State and National codes and regulations including but not limited to;
 - 1. N.J.A.C. 8:26
 - 2. N.J.A.C. 514A
 - 3. IPSC 2015
 - 4. National Plaster's Council Technical Manual Seventh Edition

1.13 JOB CO-ORDINATION

- A. All Contractors are cautioned to clearly understand the limits of responsibility as detailed in these specifications. Prior to a work start, a meeting shall be held at the jobsite to establish work limits, job schedule and liaison among the Prime Contractor, Sub-Contractors, and the Owners Representative to ensure a coordinated construction process.

End Section 13 11 00

**SECTION 13 1110
SWIMMING POOL SHELL CONSTRUCTION**

PART 1 – GENERAL

1.1 STANDARDS

- A. All construction shall be in accordance with standard industry practices, using new materials to produce a quality finished product.

PART 2 - EXCAVATION, GRADING, BACKFILLING

2.1 DESCRIPTION

- A. The work of this section includes the provision of supervision and co-ordination during the excavation and placement of stone subbase. The excavation and crushed stone are not included in the work of this section and are specified in other divisions of these specifications.
- B. Before construction of pool shall be commenced, the Pool Contractor shall place batter boards permanently locating the perimeter of the pool structures at the required elevation
- C. The Pool Contractor shall then coordinate with the other trades performing such precedent work as excavation, so as to assist in maintain dimensional accuracy and quality control.
- D. The Pool Contractor shall erect a either a screed form or full perimeter backform for all pool construction as site conditions warrant. Backform shall be of sufficient strength and rigidity to support the anticipated pneumatic concrete placement without movement or deflection. Provide shop drawing describing means and methods.
- E. The rough grading around pool shall be controlled so that ground is pitched to prevent water running into the excavated area of the pool. Such work is not included in the work of this section and is specified elsewhere.
- F. Dewatering of pool and pool proper is included in the work of this section.
- G. Backfilling behind the completed concrete pool structure is not included in scope of work of this section. The Pool Contractor shall however coordinate this work with the trades performing it and shall endeavor to ensure that all backfill material is ¾" clean crushed stone or other controlled fill.
- H. Machine excavation, trenching, and backfilling of any description and disposal of excavated material are not included in scope of work of this section.

PART 3 - POOL WALL & FLOOR FORMING

3.1 DESCRIPTION

- A. The Pool Contractor shall furnish and erect a screed or full perimeter wall backform against which the pneumatic concrete shell shall be placed. Form shall in any case properly designate the outline of the pool including the beam section of the wall.
- B. The Pool Contractor shall take all necessary measures and precautions to ensure the integrity of the perimeter form to ensure no movement or deflection during the concrete placement process.
- C. Wooden materials utilized for any portion of the backform that will remain in place subsequent to concrete placement shall be pressure-treated.
- D. The Pool Contractor shall supply and place structural, extruded polystyrene insulation (foam) fill as shown on the drawings. The foam fill shall meet or exceed ASTM D1621 compressive strength

requirements and shall comply with ASTM C578 Type VII. The structural foam shall be Dow Styrofoam Highload 60 or approved equal.

PART 4 - PLACEMENT OF FITTINGS

4.1 DESCRIPTION

- A. Before commencing the steel and/or concrete shell work, the Contractor shall place all special pool fittings and receptacles that are to be embedded in the concrete structure and shall be responsible for their positioning in accordance with the drawings.

PART 5 - STEEL REINFORCEMENT

5.1 DESCRIPTION

- A. Steel reinforcing shall be placed accurately in position as noted on project drawings, and securely fastened and supported to prevent displacement before or during concrete placement. Cleaning, bending, placing and splicing of reinforcement shall be done in accordance to American Concrete Institute Building Code. Minimum lap for spliced bar reinforcing shall be thirty (30) bar diameters. No splicing shall be made except where supported. Metal chairs or concrete blocks shall be used to support steel away from the support slabs.
- B. After reinforcing has been placed and supported, no wheeling of materials shall be done across steel except over proper run-ways bearing on forms rather than reinforcing. Lifting reinforcement by estimate as concrete structure is placed will not be allowed.
- C. All reinforcing steel shall be standard sizes of deformed bars equal to the requirements of the "Standard Specifications for New Billet Steel, Concrete Reinforcement", Intermediate Grade, Serial Designation ASTM A-615, Grade 40, latest revision, as adopted by the American Society for Testing Materials.
- D. Reinforcing steel shall be sized and positioned as noted on drawings.
- E. Steel reinforcing placement schedule is predicated on the following:

Method of analysis: ACI-31B, ultimate strength method concrete pump mix: 4000 psi
fr = 600 psi
reinforcing: fy = 40 ksi
soil backfill @ walls: 120 pcf
angle internal friction of soil = 34 degrees
soil/subbase: 6" compacted crushed stone K = 300 pci

In the event unforeseen field conditions necessitate a revision of the steel schedule, size or placement, the contractor shall be entitled to a change order.

PART 6 - PNEUMATIC CONCRETE

6.1 DESCRIPTION

- A. The pool structural design is based on the use of pneumatically applied concrete, utilizing wet mix delivery equipment (shotcrete). There are no expansion joints required or allowed in the pool structure. All pneumatically applied concrete shall meet 4000-psi design requirements tested in accordance with the procedures outlined herein. The pool structure is designed as a monolithic unit and all concrete for pool walls and floor, shall be placed in one unit of construction, insofar as

possible, in one continuous operation or on consecutive days. Set surfaces against which new concrete is to be placed shall be thoroughly cleaned and slushed with neat cement. Structural designs as shown on the pool drawings shall govern.

- B. Crew qualifications including foreman - A foreman who normally has proficiency at all crew positions and should have a minimum of 3000 hours experience and the nozzleman who should have certification (refer to ACI 506.3R) or a minimum of 3000 hours experience as a nozzleman. He should be able to demonstrate, by test, his ability to satisfactorily perform his duties and to apply pneumatically applied concrete as required by these specifications.
- C. Wet-nozzle gunite (shotcrete) must test 4000 psi after 28 days.
- D. At the end of a day's shooting or any similar stopping point the shotcrete shall be tapered to a thin edge. Before shooting the next day, the tapered portion shall be thoroughly cleaned and wetted. No square joints will be allowed.
- E. Taunt cutting wires shall be established and anchored to insure dimensions integrity of the shotcrete structure. Cutting wires shall be placed at all intersections of pool radius and vertical walls and on floor elevation pins to insure dimensional accuracy of the structure.
- F. Protect shotcrete against frost and rapid drying and keep moist for at least six (6) days after placing; during this period shotcrete shall be maintained above 32 degrees F for at least five (5) days.
- G. All cement for shotcrete shall conform to the requirements of the "Standard Specifications for Portland Cement" serial designation C-150 of the ASTM and shall be Type I or Type II, and shall be delivered to the job site in original packages and well protected from weather and moisture during storage.
- H. The mix design shall be as noted below. The mix design may be modified to address the specific characteristics of the local aggregate or to address weather conditions. Modified mix designs must be submitted for approval prior to placement.

Mix Design

Sand	1,750 lbs.
Cement	750 lbs.
3/8" Stone	950 lbs.
Air	7 %
Slump	3"

Non-metallic mesh fibers in accordance with mfg. recommendations if indicated by field or weather conditions.

- I. Pneumatic concrete placement utilizing the "dry-nozzle" gunite process is not encouraged but may be considered equivalent based upon the review and acceptance of the Pool Contractor's mix design and application subcontractor. The decision of the Consultant regarding the approval of the "dry-nozzle" process shall be considered final.

PART 7 - GROUT

7.1 DESCRIPTION

- A. The voids between the stainless steel gutter system and the pool shell shall be filled with a non-shrink grout. This grout shall be comprised of 8 bags Portland cement mixed with 3000 lbs. of washed concrete sand. To this mixture add a non-metallic expansive additive similar in performance to "Interplast N" manufactured by the Sika Chemical Corporation of Passaic, NJ, Fritz-Pak "NS-7", Fairmate Chemicals "FAIRADD" or approved equal. This material shall be utilized into each yard of grout material placed

- B. Before placing grout the contact surface of the pool shell shall be thoroughly cleaned and moistened; grout shall be rodded and puddled to insure complete filling of all voids. Once grout has taken initial set the interior form shall be removed, any voids discovered immediately filled and the surface of the grout dressed to desired texture. Rebate for caulked joint should be cut, cleaned and dressed to insure optimum placement and proper bonding.

PART 8 - INTERIOR FINISH OF SWIMMING POOL

8.01 EXPOSED QUARTZ AGGREGATE POOL FINISH

- A. The Contractor shall furnish and install a permanent quartz aggregate plaster interior coating as shown on the project drawings. Coating shall include a blend of quartz aggregate and polymer-modified white cement.
- B. Quartz aggregate plaster coating shall be "Diamond Brite" as manufactured by Southern Grouts and Marble, 1502 S.W 2nd Place, Pompano Beach, FL 33069 800-641-9247, 954-943-2288, "Sunstone" or approved equal. Color to be "Cool Blue" or such other color as may be selected by the Owner/Engineer.
- C. The finish shall be $\frac{3}{8}$ " to $\frac{1}{2}$ " thick and shall be troweled to a smooth, dense, impervious surface. Extreme care shall be taken to avoid staining the surface of the finish during troweling operations.
- D. Prior to application of the finish, the surfaces to be coated shall be thoroughly cleaned of dust, oil, paint, loose materials and any foreign matter.
- E. Expose plaster aggregate strictly utilizing a method approved by the manufacturer.
- F. Interior finish shall be applied by mechanics having at least three (3) years experience in the application of this finish to gunite swimming pool interiors.

8.02 CERAMIC TILE

- A. Ceramic tile work shall be installed in conjunction with plaster interior and as indicated on the drawings.
- B. Ceramic tile setting materials must comply with LEED requirements for low-emitting adhesives or similar materials.
- C. The Contractor shall furnish and install 1" x 1", or 2" x 2" ceramic tile work within the pool shell as indicated on the drawings. The Owner/Engineer shall select color.
- D. Tile shall be certified by the Tile Council of America (TCA) to be equal to or in excess of standard grade requirements of ANSI A-1237.1. Grouting and setting materials shall be as manufactured under TCA criteria.
- E. Tile shall be ceramic mosaic "Standard Grade" porcelain units, cushion edge.
- F. Waterline tile, step edge markings, and any warning stripes in plaster pools shall be installed in a "thin-set" bed of mortar in accordance with the specifications of the American National Standards Institute.
- G. Waterline depth markings shall be 6" X 6" smooth, glazed tile with 4" characters as manufactured by *Inlays* or equal.
- H. Deck depth markings shall be 6" X 6" slip-resistant tile with 4" characters as manufactured by *Inlays* or equal.
- I. Each depth marker location on the pool deck and in the waterline shall include an international-style "No Diving" symbol.

- F. All setting and laying of tile shall be by experienced tile mechanics who can supply evidence that they have been steadily employed in the installation of the pool tile work during the past three (3) years.

ENDOFSECTION 13 1110

SECTION 13 11 20
SWIMMING POOL RECIRCULATION SYSTEMS

PART 1 – LAP POOL RECIRCULATION SYSTEM

1.01 SUMMARY

- A. It is the intent of this Specification to describe an in-pool swimming recirculation system furnished and installed by the Contractor that consists of the following components:
1. Stainless Steel Overflow System - A factory-fabricated stainless-steel perimeter overflow system incorporating components fabricated to the configuration described and as illustrated by the drawings and that perform the functions described herein.
 - a) Primary overflow channel
 - b) Integral, source-capture plenum
 - c) Integral, isolated filtered water supply conduit
 - d) Sloped, 17.5", one-piece HDPE Channel grating
 - e) Collector and converter boxes
 - f) Channel wash and Flow enhancers
 - g) Anchorage
 - h) Integral rope anchors
 2. Main drains and associated components.
- B. All construction and equipment shall be in accordance with standard industry practices, using new materials to produce a quality-finished product.

1.02 QUALITY OF MATERIAL:

- A. The method of water recirculation specified and shown on the detailed drawings is intended as the basis for receiving bids and is the preference of the Owner.
- B. The basis for design for the stainless-steel perimeter overflow system is the Model R-300TGEC - deck level, with source-capture (Evacuator) plenum, as manufactured by Paddock Pool Equipment Company, Inc. of Rock Hill, South Carolina, and is as illustrated on the drawings or approved equal.
- C. Proposed equivalent systems are referenced below as "substitutions". Any bidding contractor wishing to submit a substitution may do so provided the complete substitution process outlined in Division 1 is complied with. Requests for substitutions must be made before the bid. Requests made after the bid will not be considered. Consideration of such a substitution by the Consultant/Owner will be given provided that the following information and documentation is provided with the bid.
1. Information to prove the manufacturer of the proposed system has at least 10 systems performing the same hydraulic and source-capture functions described by these specifications, in service for three (3) years or more on pools of 950 square feet or more.
 2. A 6" section of the proposed system demonstrating the final finish and configuration of the system when installed.
 3. Mathematical and/or empirical verification of the system's compliance to the performance requirements set forth below must be submitted with certification of the calculations by a Professional Engineer licensed in the State of Maryland.
 4. Any proposed perimeter system must meet the intent, configuration and function of the product herein specified.

5. In the absence of any substitutions, it will be understood that the bid is strictly in accordance with the drawings and specifications and that no deviation there from will be permitted.

- D. The Architect/Owner will make the necessary investigation and verification of information submitted and, in the event a substitution is accepted, all bidders will be so notified.

1.03 QUALITY ASSURANCE:

- A. The swimming pool perimeter system shall be the product of a manufacturer having a least five (5) years' experience in the fabrication and manufacturing of stainless-steel swimming pool systems and at least ten (10) installations within the State of Maryland or within a 75-mile radius of this project site, which incorporate perimeter systems which function as herein specified, and which are currently in satisfactory operation on municipal and/or institutional projects.
- B. A manufacturer's reference installation list, which meets the above criteria, shall be submitted upon request.
- C. Complete hydraulic calculations that establish the hydraulic capabilities of the system specific to this project shall be submitted for approval upon request. Swimming pool gutter recirculation systems shall follow the requirements and codes that govern such systems within the State of Maryland.

1.04 DELIVERY, STORAGE AND HANDLING:

- A. Shop fabricated sections shall be delivered to the job site adequately packaged to prevent damage. The Contractor shall execute unloading and storage. The materials shall not be stacked or stored in any manner that could cause damage or deform the materials.

1.05 PROJECT SITE CONDITIONS:

- A. The project site shall be in accordance with the manufacturer's technical bulletins.

1.06 WARRANTY & MAINTENANCE INSTRUCTIONS:

- A. The recirculation system shall be guaranteed by the manufacturer for workmanship, materials and performance for a period of two (2) years. This guarantee shall include all labor and material for replacement of any defective materials or work, but shall not include or cover abusive or improper treatment to the recirculation system by others during construction or when operational.
- B. Provide complete descriptive information detailing proper care, maintenance and cleaning of the system.

1.07 PRODUCTS

- A. It is the intent of the specifications to provide a perimeter stainless steel overflow recirculation system such that the overflow system channel flow and surface cleaning be maintained under all conditions of normal operation and that no water be discharged to waste.
- B. It is the intention of these specifications that the perimeter system be sized to accommodate the required surge storage requirement and 100% of the design flow and anticipated bather load using only one overflow converter and one supply converter.

1.08 GUTTER PERFORMANCE:

A. Perimeter Overflow System:

1. The width of the gutter lip shall not exceed 2 1/2" with sufficient clearance in gutter trough to provide an adequate handhold.
2. The perimeter overflow system shall remove, contain and transport to a single point of discharge and collection, all surface debris and contaminants introduced into the pool. This ability must be provided on a continuous basis by design, ensuring that the overflow gutter trough remains in a non-flooded condition at all times.
3. Water cresting the overflow lip or otherwise transiting through the grating shall be readily received through the grating without ponding and into the primary channel.
4. The system shall provide a safe, functional handhold by way of proper gutter lip design around the entire pool perimeter, which shall be an integral part of the grating.
5. The hydraulic flow capability of the system shall be capable of handling 125% of the maximum design recirculation rate.
6. Jet wash fittings shall be supplied at required locations in gutter trough to insure continuous washing of gutter channel and provide channel flow enhancement.
7. The gutter configuration, shall be as shown on the drawings. All contours shall be smooth, and all surfaces exposed to gutter flow shall be easily cleanable of scum and surface oil build-up.
8. Perimeter system shall be designed such that all longitudinal welds are fully exposed and accessible for visual for inspection. All factory welds are to be opposing to compensate for reverse bowing and maintain proper tube alignment.
9. The perimeter recirculation systems shall include converter assemblies for filtered return channel, overflow channel, and auxiliary surge recovery channel, constructed of low carbon type 316-L stainless steel, providing flanged connections to piping runs between the overflow system and the filter plant.

B. Filtered Water Return Channel:

1. The system shall contain an integral stainless-steel return piping system to distribute freshly filtered and treated water to all parts of the pool.
2. System shall completely eliminate buried perimeter recirculation piping except for piping required to connect system to filter plant.
3. The filtered water return tube shall be fitted with variable sized nylon jet inlet nozzles not over 36" on center around the entire pool perimeter except where inlets shall be expressly deleted at stairways or touch pads.
4. These inlet jets shall be installed so as to provide a stream of filtered sanitized water on a fixed 45-degree angle directed toward the bottom of the pool.
5. The system shall provide a filtered pressure water inlet system operating at a pressure not exceeding 12 psi in which the inlets shall each supply a hydraulically balanced flow of filtered sanitized water to the pool.
6. The inlet openings shall be fitted with non-adjustable, nylon nozzles and shall not be larger than 9/16" in diameter.
7. The filtered water supply conduit shall be machine welded using the TIG process by the manufacturer in his plant and pressure tested prior to shipment.
8. The filtered water supply conduit shall provide a constant flow to flush the gutter channel with an adequate quantity of filtered water to serve as a cleaning and flow enhancement system.

C. Source-capture Exhaust Plenum

1. The system shall contain an integral source capture exhaust plenum along one pool wall.

2. The plenum shall be defined within the width of the gutter channel so that the overall gutter width is consistent all around the pool.
3. A stainless-steel flange shall be provided for buried ductwork connection as shown on the drawings.

1.09 COMPONENTS AND EQUIPMENT:

A. Perimeter Overflow Channel:

1. The gutter overflow channel shall be formed to the dimensions and configuration detailed on the drawings. The shop-fabricated sections shall be delivered to the job site for field installation.
2. The gutter dimensions shall be as shown on the drawings. Proposed alternate systems shall not contain less cross-sectional area to insure smooth, unimpeded water flow.

B. Stainless Steel Filtered Supply Channel:

1. The supply conduit shall be of the size and configuration detailed on the drawings.
2. Jet inlet orifices shall be selectively spaced continuously around the pool perimeter. These orifices shall provide balanced water distribution throughout the pool. The orifices shall project downward at a 45-degree angle to ensure optimum distribution of the filtered water.

C. Stainless Steel Collector and Converter Boxes:

1. There shall be supplied one (1) filtered supply converter box and one (1) perimeter overflow collector box. The collector and converter boxes shall be fabricated from low carbon type 304-L or 316-L stainless steel. The supply converter shall be provided with a coated mild steel flanged connection. The gutter collection box shall also be provided with a stainless steel flanged connection. Gutter return converter boxes shall be designed to boost velocity through the gutter outlet utilizing a flow velocity accelerator configuration. After installation, the collector boxes shall be fully encapsulated in concrete by the Contractor. Ensure the flange extends 6" beyond back of wall.
2. Perimeter recirculation systems that require multiple supply or return converters will not be acceptable.
3. Perimeter recirculation systems that include a PVC filtered water supply chamber will not be acceptable.

D. Anchorage:

1. The recirculation system shall be anchored to the pool structure prior to gutter installation with commercial quality "U-Bars" or "Drop-In-Anchors" as manufactured and/or provided by the perimeter system manufacturer.
2. The anchors shall be installed at the elevation indicated on the gutter detail, located 1' off the corners in both directions, and the remainder at maximum 3-foot centers around pool perimeter.

E. Channel Grating:

1. The grating shall be formed of milled, high-density polyethylene (HDPE) and shall include the overflow lip/handhold.
2. The top surface shall be serrated to create a non-skid surface with the space between extruded sections not exceeding 9/32".

F. Lap/Separation/Safety Line/ Rope Hooks:

1. Rope Hooks shall be provided as indicated on project drawings. Fully recessed stainless steel units with cross bar shall be provided for safety line separation ropes. Units to be mounted in vertical face of perimeter recirculation system.

1.10 MATERIALS:

- A. All perimeter system parts, and fittings, unless otherwise specified, shall be type 316-L certified stainless steel.
- B. The exposed surfaces of the filtered water supply tube which forms the front lip of the gutter section shall be fabricated of 12 gauge type 316-L stainless steel with a finish similar or equal to a #3 polished (100 mesh abrasive) finish. The 1 1/2" x 3/16" angle anchors and all stiffener brackets shall be stainless steel. The gutter channel sections shall be fabricated from type 304-L stainless steel with a finish similar or equal to a #3 polished (100 mesh abrasive) finish.

1.11 POOL MAIN DRAINS

- A. Main drain boxes, grating, and piping shall be sized to accommodate 100 % total recirculation rate.
- B. Velocities through grating shall not exceed 1.5 fps.
- C. Submerged main drain sumps and gratings shall be compliant with the Virginia Graeme Baker
- D. Grating shall not have openings greater than one-half inch.
- E. Piping designed for flow rate not exceeding 3 fps to lance header.
- F. Drains shall be unblockable-style with flush grating, CMP model 25506-320-000 or approved equal.

PART 2 - INTERCONNECTING PIPING

2.01 DESCRIPTION

- A. The Contractor shall supply and install all piping, pipe fittings and valves, as required, from the pool fittings and/or perimeter recirculation system to the juncture of the filter equipment; all piping, pipe fittings and valves from pool main outlet line; sanitizer lines where indicated; all piping and pipe fittings within the filter room required and as shown on the plans; all pipe hangers, rods and supports and other material to complete the intended scope of work.
- B. Any item of equipment or materials obviously a part of the filters and pool recirculation systems and necessary to their operation, but not specifically mentioned in the specifications or shown on the drawings shall be furnished and installed by the Contractor as part of his work at no extra cost to the Owner.
- C. Contractor shall provide viable methods of winterizing all above and below grade piping and shall explain such methods in the operation manual. Appropriate drain plugs, blow-out ports or other accommodations as may be required for winterizing the pools in accordance with standard industry practice shall be provided whether or not specifically shown on the project drawings.
- D. Workmanship - All materials to be used in this work shall be installed by workmen thoroughly skilled in their trade and all work shall present a neat and mechanical appearance when complete.

2.02 PIPING MATERIALS

- A. Out-Pool Process Piping - swimming pool piping which is used for connection of all pool recirculation lines between the filter plant and all gutter converter connections as well as all other pool fittings or fixtures, shall be polyvinyl chloride (PVC) plastic pipe, type 1-1220, Schedule 80 IPS, or as noted below.
- B. PVC pipe glue must comply with the LEED requirements for low-emitting adhesives

2.03 MAIN DRAIN PIPING

- A. Underneath Pool Shell - Piping shall be Schedule 80 polyvinyl chloride (PVC) plastic pipe with similar fittings.
- B. Outside Pool Shell - Piping shall be Schedule 80 polyvinyl chloride (PVC) plastic pipe with similar fittings.

2.04 FILTER CONNECTION PIPING

- A. All piping within the confines of the filter room and above the filter room floor including the piping which connects the filter to the filter pump, the recirculation piping, backwash piping, and other drain piping shall be of polyvinyl chloride (PVC), Type 1-1220, Schedule 80 IPS.

2.05 SANITIZER SOLUTION LINES

- A. Sanitizer solution lines shall be of plastic, polyvinyl chloride (PVC), Type 1-1220, Schedule 80 IPS, or of a type recommended by the sanitizer manufacturer.
- B. The maximum length of exposed tubing shall be 3', beyond which tubing shall be converted to schedule 80 PVC pipe or shall be conducted in conduit segments.

2.06 FITTINGS

- A. Fittings for plastic pipe shall be of schedule of plastic pipe required and shall govern schedule of fittings utilized. Fit of fittings and pipe shall be proper and capable of developing full strength of the piping system.

2.07 VALVES

- A. Small Valves - valves up to and including two (2) inches in size shall be PVC ball valve as manufactured by Spears, Hayward, GS Sloan, or approved equal.
- B. Large Valves - valves three (3) inch and larger shall be butterfly wafer valves equal to "Asahi" "Dominion" or "Bray" Series 30-106, bronze disc, stainless steel stem, buna N seat, gear or lever operated as shown.
- C. Buried Valves - valves which are placed below grade shall be suitable for use intended and shall be as manufactured by "Kennedy", "Star" or approved equal.
- D. Valve Extension Stem and Keys - where required, the Contractor shall furnish and install valve extension stem and/or keys. Keys and extensions shall be as manufactured by Spears, Hayward, GS Sloan, or approved equal.

2.08 INSTALLATION

- A. Handling - pipe and accessories shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition.
- B. Cutting of pipe - shall be done in a neat and workmanlike manner without damage to the pipe.
- C. Placing and Laying - before installation, pipe shall be inspected for defects. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during laying operation. Pipe shall not be laid in weather conditions unsuitable for the work. Open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substances will enter the pipes or fittings.
- D. All interconnecting piping must be placed within precast concrete pipe culverts. It is anticipated that the culverts may become flooded periodically while the pipe are empty and they must therefore be supported tightly as shown on the project drawings utilizing FRP Unistrut or an equivalent non-corrosive pipe support system. Support spacing shall be as recommended by the pipe manufacturer for traditional gravity support conditions.
- E. Refer to section 13 1100 for testing requirements.

2.09 JOINTS

- A. Mechanical, Threaded, and Solvent-Welded Joints - shall be made in accordance with the manufacturer's recommendations.
- B. All connections between PVC and metal pipes must be flanged, plastic flange to metal flange, except where specifically noted otherwise.

2.10 FLUSHING

- A. All pipelines leading to the pool shall be thoroughly flushed clean before the pool is filled and placed in use.

END OF SECTION 13 11 20

**SECTION 13 1130
SWIMMING POOL FILTRATION SYSTEMS**

PART 1.0 GENERAL

1.01 Description of Work

- A. All construction and equipment shall be in accordance with standard industry practices, using new material to produce a quality-finished product
- B. It is intended that the Pool Contractor shall furnish and install a complete and operating, high-rate sand filtration system.
- C. The Pool Contractor shall supply and install directional arrows, laminated valve tags and a valve chart for the system.
- D. Any piping, pipe supports or item of equipment obviously a part of the filter system and/or necessary to its operation but not specifically mentioned herein or on the drawings shall be furnished by the Pool Contractor at no extra cost.
- E. The filter system specified is NSF listed and approved. Any filter (or filter lining if any) offered under these specifications shall be NSF listed at the time of offering (bid date). Such listing shall be evidenced by the filter model number appearing in the current NSF listing for swimming pool filters at the flow rate required for this project. The filter shall be a product of a manufacturer regularly engaged in the fabrication of water filtration equipment and who has a minimum of five (5) years experience in this field.
- F. The method of water filtration specified and shown on the detailed drawings as well as the method of removing spent media is intended as the basis for receiving bids and is the preference of the Owner. The Owner and Owners representative have made a detailed investigation before selecting the specified swimming pool filtration equipment. All bids shall include this equipment noted as the basis of design or an approved equivalent without substitution since the operation and maintenance of the swimming pool facility, the existing building structure, the interface of related equipment with the building structure, and governmental approvals and permits are predicated upon the specified equipment.
- G. It is not the intent of these specifications to, in any way, limit or restrict the bidder in the preparation of its bid. It is assumed that unless otherwise stated, the bidder is offering the equipment, products, and quantities of items as specified herein and is totally obligated to furnish that equipment in literal compliance with these specifications. Procedures for substitutions are addressed elsewhere in these specifications. Complete product data for any substitute system must be submitted for review by the Consultant/Owner.
- H. The Consultant /Owner will make the necessary investigation and verification of information submitted and will determine whether it is in the best interest of the Owner to accept the substitute in lieu of the specified, base bid component(s).

1.02 Shop Drawings

- A. The Pool Contractor shall note that so long as the components identified as the basis of design are utilized, a filter room layout will not be a required submission. However, in the event a substitution is allowed, the Pool Contractor shall prepare and submit shop drawings indicating the materials, size and placement of all piping and equipment to be furnished.
- B. The drawings shall indicate the general arrangement of the pool plumbing and mechanical equipment. Pool Contractor shall be responsible for proper fitting of materials and equipment into

the space allotted without alteration. The Owner/consultant may require that such drawings be prepared and sealed by a Professional Engineer.

- C. The Pool Contractor shall provide shop drawings or catalogue cuts for all components to be utilized in the filter room and submit same for approval. If the Pool Contractor utilizes any approved substitutions or major components other than those stipulated as the basis for design, provide detailed shop drawings on construction and equipment layout.
- D. Provide a complete set of operating instructions, embracing the operational functions and recurring maintenance processes involved in connection with the complete filtration system.

1.03 Materials

- A. New Piping: All main drain, filter system and filter room piping shall be PVC Type 1-1220, schedule 80, conforming to commercial standards, U.S. Department of Commerce, CS-207-60, and shall be approved by NSF. Heater connection piping shall be CPVC.
- B. Chemical Feed Lines: Chemical feed lines shall be of plastic or a material impervious to chemical being fed. Tubing feed lines of more than three feet in length shall be in conduit or supported by conduit segments, otherwise tubing shall be replaced by rigid PVC and supported as noted below.
- C. Fittings: Fittings shall be of similar schedule and material as pipe and shall be capable of developing full strength in the piping system. All fittings, regardless of size, shall be molded.
- D. Pipe supports shall be galvanized Unistrut with appropriate fittings. **It is specifically noted that cut pipe sections, clevis hangers, riser clamps or other similar support fittings will not be permitted.** Threaded rod shall be galvanized and shall only be used when hanging Unistrut from above. Thrust bracing shall be provided as required to eliminate any pipe movement. Supports shall be placed in accordance with the pipe manufacturer's recommendations.
- E. Valves:
 - 1. Up to and including 1" - "Compac" PVC ball valves.
 - 2. 1" up to and including 2 1/2" - "True-Union" PVC ball valves.
 - 3. 3" up to and including 6" - Lever operated butterfly valves.
 - 4. 8" and larger - Gear operated butterfly valves.
 - 5. Butterfly valves shall be nylon-coated, iron body, or PVC wafer-style valves with quick opening (quarter turn) handles for full open, suitable for intended use.

PART 2.0 FILTRATION EQUIPMENT

2.1 Filter Requirement

- A. It is the intent of this specification to describe water filtration systems complete with all necessary items.
- B. The filters shall be high-rate sand.
- C. The primary components of each system consist of the filter tank, influent internal distribution, sand media, underdrain collection and operating valves.

- D. All components and related subassemblies shall be factory assembled and tested prior to shipment.
- E. The basis for design along with relevant application rates for each system are noted on the drawings. Bidders are cautioned that the use of an equivalent system will require a submittal drawing showing actual filter placement within the available space to ensure proper fit and access to operating personnel.

2.2 Filter System Capacity

- A. Each system application rate is noted on the drawings.

2.3 Filter Tanks

- A. Each filter tank shall be one-piece fiberglass.

2.4 Filter Media

- A. Media shall be standard filter sand.
- B. The media shall be certified by the Manufacturer for use in the Filter.

2.5 Filter Control and Gauge Assembly

- A. Provide factory influent gauge atop filter and matching effluent gauge on effluent piping at a location intuitive to the operator adjacent to the filter tank.

2.6 Filter Piping and Valves

- A. Filter units shall be provided with supports and brackets, manifold, and elements. Piping shall be arranged to carry out operations of filtering and backwashing. External piping connections shall be flanged when larger than two inches. Filter tank assembly shall be provided with necessary pipe, valves, and fittings to make a complete system from inlet to outlet.

2.7 Warranties

- A. The filter manufacturer shall warrant the filter tank to be free of defects in material and workmanship under normal use and service within 5 years of first use. Components and parts by other manufacturers are subject to terms, conditions and limits under their warranty. The filter manufacturer's obligation under this warranty shall be limited to repair or replacement of any item which upon its examination shall prove to be defective.

PART 3.0 PUMPS AND MOTORS

3.1 Pool Recirculation & Feature Pumps

- A. Pump capacities and the basis for design are noted on the drawings.
- B. The characteristics, configuration, materials of construction and other features shall constitute a standard of quality and performance for any proposed substitution.
- C. All motor controls, bonding, wiring, conduits, disconnects or other field electrical work is by the electrical contractor and is not included in the work of this section.

- D. The Pool Contractor shall include a 3rd party bonding inspection and certification at the completion of the project.

PART 4.0 PRESSURE & VACUUM MEASUREMENT

4. 1 Gauges – all pumps

- A. There shall be supplied and installed on the pump suction one vacuum gauge, 4", 0-30 inches mercury, as manufactured by Weksler, Marsh or equal.
- B. There shall be supplied and installed on the discharge side of the pump, one pressure gauge vacuum gauge, 4", 0-60 psi, as manufactured by Weksler, Marsh or equal.
- C. Gauges influent and effluent to the pump shall be located so as to accurately reflect pump vacuum and discharge pressure for the purpose of calibrating flow meter.

PART 5.0 FLOW CONTROLS AND METERS

5.1 Flow Meter - Filtered Water Supply

- A. The Pool Contractor shall supply and install one (1) rate of flow meter that shall be installed on the filtered return line, as noted on drawings.

PART 6.0 MAKE-UP WATER SYSTEMS

6.1 Automatic Domestic Water Level Control System

- A. A domestic water feed will be extended from its existing location into the new filter room as shown on the drawings, terminating with an RPZ valve. The Pool Contractor shall connect to the valve and construct the automatic level control system shown on the drawings
- B. The basis for design and connection point to the respective filtration systems is shown on the drawings.

PART 7.0 POOL HEATING SYSTEM

7.1 Automatic Domestic Water Level Control System

- A. The Pool Contractor shall supply and install a natural gas, direct heat exchange pool heater as shown on the drawings.
- B. The basis for design is shown on the drawings.
- C. Any and all fuel connections or combustion/exhaust venting is specified elsewhere and is not included in the work of this section.

END OF SECTION 13 1130

**SECTION 13 1140
POOL/SPLASH PAD WATER CHEMISTRY**

PART 1 GENERAL

1.01 STANDARDS

- A. All construction and equipment shall be in accordance with standard industry practices, using new materials to produce a quality, finished product.

1.02 DESCRIPTION OF WORK

- A. It is the intent of this specification that the Contractor furnish and install an integrated disinfection/control system which shall include chlorination, pH adjustment, and automatic chemistry ORP (sanitizer)/pH control.

1.03 RELATED SECTIONS/DOCUMENTS

- A. Drawings and General Provision of Contract, including General and Supplementary Conditions and Division 1 - Specification Sections apply to the work specified in this section.

1.04 REGULATORY AGENCY REQUIREMENTS

- A. The entire system shall be designed and installed to meet all applicable State and Local codes. Nationally recognized standards, including applicable NSF and UL listing requirements, shall be adhered to.

1.05 QUALITY OF MATERIAL

- A. The Contractor shall furnish and install this equipment as herein specified and as shown on the project drawings.
- B. It is not the intent of these specifications to, in any way, limit or restrict the bidder in the preparation of its bid. It is assumed that unless otherwise stated, the bidder is offering the equipment, products, and quantities of items as specified herein and is totally obligated to furnish that equipment in literal compliance with these specifications.
- C. The burden of substantiating the equivalency of any proposed substitute system is upon the bidding contractor's firm. The Consultant's decision of approval or disapproval of a proposed substitute system or equipment is final. In the event the Consultant / Owner shall not accept any proposed system or equipment, then the Contractor shall be required to furnish the materials specified at no extra cost to the Owner.

Part 2: LIQUID CHLORINATION SYSTEM

2.01 GENERAL DESCRIPTION.

- A. The systems shall be designed to feed sodium hypochlorite in solution intermittently or continuously as required for pool applications.

202 CHEMICAL FEEDERS

- A. The feeders shall be adjustable, peristaltic type, with a polycarbonate plastic case and

replaceable variable sized LDPE polyethylene tube.

- B The feeders are to be model number as shown on the drawings and as manufactured by Stenner, 3174 DeSalvo Rd., Jacksonville, FL

2.03 CHLORINE STORAGE TANK

- A. The chlorine storage tank shall be a double-wall, 200-gallon polyethylene container as manufactured by Chemtainer, West Babylon, NY, model TC-4152DC or approved equal. Bulkhead fittings shall be provided on tank top to accommodate pipe penetrations as shown on the drawings.

2.04 WARRANTY

- A. The manufacturer shall guarantee in writing that this unit, if operated in accordance with written instructions given and accepted by the Owner, will perform in complete accord with the specifications. All components will be warranted against manufacturers' defects for twelve (12) months.

PART 3 pH CONTROL SYSTEMS

3.1 DESCRIPTION

- A. This specification covers the products and installation of equipment utilized in the control of pH adjustment in swimming pool water with the use of Carbon Dioxide gas. The system shall be NSF approved.

3.02 SYSTEM COMPONENTS

- A. The carbon dioxide system shall consist of a simplex manifold, solenoid valve, regulator/flow meter, valves, controls, injectors, and all fittings as shown on the project drawings and as required to make a complete system.
- B. The manifold shall be constructed of 1/2" solid brass suitable for connection of two (2) tank systems. Each tank shall have a separate on/off valve with a 1/2" female pipe thread allowing hook-up of stainless steel pig tail from CO2 manifold to CO2 tanks.
- C. The regulator/flow meter shall be factory set at 80 psi with adjustable rate of flow meter calibrated at 25-100 SCFH.
- D. Flow shall be controlled through a normally closed stainless steel solenoid valve with 120 VAC, single phase operator.
- E. Carbon Dioxide from feed unit shall be injected through 1/4" NPT fittings. Unit shall cause CO2 to be totally diffused and made to go fully into solution without evidence of CO2 bubbling at any point where water is open to atmosphere.
- F. Unit must be equipped with a stainless-steel duckbill type check valve to prevent the flow of water back into the feed unit.
- G. Unit will provide for automatic switchover from empty tank to new tank.
- H. The Pool Contractor shall supply and install a suitable safety chain to secure tanks to the wall or to a field-fabricated Unistrut frame if a wall is not available.

3.3 PRODUCTS

- A. The basis of design for the Carbon Dioxide system is the Model AC004 by Hayward Industries or approved equal.
- B. The basis of design for the automatic switchover is the Model AC006 by Hayward Industries or approved equal.

3.4 EXECUTION

- A. The Contractor shall supply all labor, equipment, and materials to construct the carbon dioxide system complete with lines, solenoid valves, valves, and injectors where and as shown on the drawings.
- B. The Pool Contractor shall establish the initial pH balance through the use of muriatic acid. The owner will supply carbon dioxide for start-up.
- C. A complete installation, operations and maintenance manual with trouble-shooting guide shall be provided.

PART 4 AUTOMATIC CHEMISTRY CONTROL SYSTEMS (all pools)

4.1 Summary

- A. This Section includes pool chemistry control and monitoring.
 - 1. Chemistry Controller
 - 2. Flow cell assembly
 - 3. Probes
 - 4. Communication

4.2 Definitions

- A. A programmable Pool Chemical Automation System shall be supplied for continuous monitoring and control of the water chemistry and related disinfection equipment.

4.3 Performance Requirements

- A. The controller shall automatically activate the appropriate chemical feeders in order to maintain the sanitizer level within ± 0.1 parts per million (PPM) or ± 10 mV (millivolts) of Oxidation Reduction Potential (ORP) and the pH within ± 0.1 pH unit of the setpoints selected by the operator. All setpoint and calibration levels shall be adjustable with a numeric keypad mounted on the front panel of the unit.
- B. The controller shall be capable of actuating all outputs in the following operator selectable modes: off, manual, automatic, proportional and PID control. The controller must be able to interface pulse output chemical feed pumps for true PID control to ensure chemical conservation.
- C. The controller shall have ORP, pH, temperature, and free and total chlorine probes. The controller must be capable of controlling a UV systems based on combined chlorine levels.
- D. The controller must utilize both ORP and PPM control. Controllers that do not have the ability to control simultaneously to ORP and PPM control points will not be allowed.

- E. The controller shall be contained in a NEMA Type 4X (rain and splash proof) lockable injection molded cabinet with a lockable enclosure.
- F. The controller shall have standard real-time monitor and control capability via a smart phone, iPad or tablet device or shall have a comparable built-in display screen.
- G. The controller shall be supplied at factory on PVC backboard.

5.4 Manufacturers

- A. The basis for design is the model DCM-201 (as shown on the drawings) by Prominent Fluid Controls, Inc. - Aquatics Division, Pittsburgh, PA USA. (Contact Dustin Kaufman, Regional Manager-Aquatics, Office 412-788-7685, Mobile 717-329-1303)
- B. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to BECS Technology, St. Louis, MO. 314-567-0088, ProMaqua Pool Products, Zionsville IN 317-769-5717

5.5 Warranty

- A. The controller shall be covered by a standard manufacturer warranty of five (5) years. All sensors will be covered by a standard one (1) year warranty. Other parts shall be covered by their own manufacturer's warranty. The controller shall not require a service technician for annual calibration or whenever chemical supplier or type is changed.
- B. The manufacturer shall supply a complete instruction, operating and maintenance manual. Check-out of installation, start up, and instruction of operating personnel shall be performed by an authorized and properly trained manufacturer representative.

END SECTION 13 1140

**SECTION 13 1150
SWIMMING POOL DECK EQUIPMENT & WATER FEATURES**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. All construction shall be in accordance with standard industry practices, using new materials to produce a quality finished product.
- B. The Pool Contractor shall furnish deck, safety and maintenance equipment and other pool accessory items as listed on project drawings including anchors and sleeves for embedment in concrete decks and anchor bases.
- C. The Pool Contractor shall be responsible for providing all embedded anchors, placement dimensions and technical assistance for anchorage placement. Actual embedment of anchors shall be by other trades
- D. The Pool Contractor shall be responsible for deck equipment assembly, erection and installation.
- E. The pool contractor shall supply and install all in-pool depth markings and shall supply-only deck graphics and markings for embedment by the deck contractor as the deck is poured. The pool contractor shall coordinate closely with the deck contractor to insure proper placement. Such coordination shall include protective taping or masking the face of the tile with properly oriented corresponding legends written on the face of the masking. The Pool Contractor shall also provide such supervision as may be required for proper placement.

1.02 EXECUTION

- A. Pool Contractor shall furnish working drawings that shall illustrate where such equipment is to be located, and will indicate all dimensional requirements of the anchor installations.

1.03 PRODUCTS

- A. Deck equipment models and manufacturers are listed on the drawings to establish a basis for design and to represent a standard of quality, performance and material which is to be met or exceeded.
- B. The Contractor shall supply and install the gooseneck shower water feature.
- C. Approved deck equipment manufacturers include Paddock Industries, Spectrum, Paragon Aquatics, Astral, Rainbow, Recreonics and SR Smith.

END SECTION 13 1150

**SECTION 13 34 13.13
GREENHOUSES**

PART 1 – GENERAL

1.01 SECTION INCLUDES

1. Attached engineered greenhouse structures with steel columns and trusses and polycarbonate panel cladding.
2. Accessory equipment to be selected and provided by greenhouse manufacturer – based on following guidelines (and further described herein):
 - a. Aluminum access door (Qty 1) and hardware - half glazed with plexiglass top
 - b. 24" Exhaust Fans (Qty 2) mounted in end wall – 2 speed with thermostat and interlocked with motorized damper**
 - c. 24" Motorized Damper (Qty 2) – mounted opposite exhaust fans**
 - d. Operable vents (Qty 2) – located high on sloped roof with motorized opener and interlocked with thermostatic controller**
 - e. Horizontal Air Fan (Qty 2) – located to promote air circulation and minimize temperature variations within the greenhouse – 3 speed manual controls only.
 - f. Propane Gas heater – 100 mbtu (structure mounted) with output from thermostatic controller. **
 - g. Mist Irrigation System – running length of greenhouse and arranged in 3 rows over grow tables with programable control
 - h. Motorized Retractable Shade System – running length of greenhouse at bottom of trusses with fabric, hardware, motor and pushbutton control
 - i. Fabricated Grow Tables – see plan for schedule

** Greenhouse manufacturer is responsible for final sizing, selection, and control of all ventilation, heating, shading and irrigation equipment noted above based on industry standards for educational greenhouse. Greenhouse manufacturer shall provide programmable

temperature control with aspirated sensor and separate outputs to control each piece of heating and ventilation equipment provided.

3. Glass and glazing

1.02 RELATED SECTIONS

- A. Section 03 30 00 – Cast-in-place Concrete
- B. Section 04 20 00 – Unit Masonry
- C. Section 07 62 00 – Flashing and Sheet Metal
- D. Section 07 92 00 – Joint Sealers
- E. Section 21 13 13 – Wet Pipe Sprinkler Systems

1.03 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Specification shall be applicable to this Project.
- C. All materials, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. NGMA (National Greenhouse Manufacturers Association) – Design Manual and Guidelines
 - 2. AAMA611 – Voluntary specifications for anodized architectural aluminum (revised).
 - 3. AAMA1503 – Voluntary test method for thermal transmittance and condensation resistance of windows, doors, and glazed wall sections
 - 4. ASTM A36/A36M – Standard specification for carbon structural steel
 - 5. ASTM B221/B221M – Standard specification for aluminum and aluminum-alloy extruded bars, rods, wires, profiles, and tubes
 - 6. ASTM B241/B241M – Standard specification for aluminum and aluminum-alloy seamless pipe and seamless tubes
 - 7. ASTM C1115 – Standard specification for dense elastomeric silicone rubber gaskets and accessories
 - 8. ASTM C864 – Standard specification for dense elastomeric compression seal gaskets, setting blocks, and spacers
 - 9. ASTM E283 – Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.
 - 10. ASTM E330 – Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference
 - 11. ASTM E330 – Standard test method for water penetration of exterior windows, curtain walls, and doors by uniform static air pressure difference
 - 12. ASTM E547 – Water penetration of exterior windows, curtain walls, and doors.
 - 13. AWS D1 – Structural welding code
 - 14. FGMA – Flat glass marketing association, glazing manual

1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance – Structural performance as tested in accordance with ASTM-E330; with no glass breakage or permanent damage to fasteners, anchors, hardware, or actuating mechanisms
 - 1. Normal wall deflection should not exceed 1/175 of clear span for span lengths of 13'6" or less and 1/240 + 1/4" for all others. Restrict deflection to 3/4" maximum for individual glazing lites.
 - 2. Parallel to wall deflection should not exceed 75% of glass edge clearance. Restrict deflection to L/360 or 1/8" maximum. Restrict deflection to 1/16" maximum above doors and/or windows. It shall be permitted to increase the deflection to 1/8" if the door operation is not affected.
 - 3. Deflection of the entire assembly, including, but not limited to, glass, shall not exceed 1 1/2"

1.05 SUBMITTALS

- A. Submit under the provisions of Section 013000 for review and approval for fabrication.
- B. Shop Drawings – Detailed drawings prepared specifically for the project by manufacturer. Include information not fully detailed in manufacturer's standard product data, including, but not limited to, wall elevations and detail sections of every typical composite member. Show opening dimensions, framed opening tolerances, profiles, product components, anchorages, and accessories.
 - 1. Indicate fastener locations, glazing, and hardware arrangement.
 - 2. Include schedule identifying each unit, with marks or numbers referencing drawings
 - 3. Must show all surrounding substrates and relevant conditions
 - 4. Must be drawn in the domestic USA, by the manufacturer of the system.
 - 5. Indicate locations and mounting requirements for all building mounted accessories, heating and ventilation equipment, shades, motors, irrigation equipment, and controls noted above.
 - 6. Structural shop drawings and calculations must be prepared, sealed, and signed by a professional engineer registered in the State of Maryland.
- C. Product Data – Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations
 - 2. Preparation instructions and recommendations
 - 3. Installation methods including mounting instructions and preferred locations for fans, louvers, heaters, and associated controls.

1.06 QUALITY ASSURANCE

- A. Manufacturer qualifications – company shall be a company specializing in the manufacturing of products specified in this section. Manufacturer shall have at least fifteen (15) years of experience in fabrication and erection of projects of similar scope.
 - 1. Manufacturer must use a cold rolled steel system comprised of domestically produced steel and is fabricated/assembled in the USA.
 - 2. Manufacturer must be a member in good standing of the National Greenhouse Manufacturer's Association (NGMA).

- B. Installer Qualifications – Installer shall be experienced in performing the work of this section that has specialized in installation of work similar to that required for this project for a minimum of fifteen (15) years.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the jobsite freight prepaid.
- B. Store products in manufacturer's original unopened packaging, covered to protect factory finishes from damage, precipitation, and construction dirt until ready for installation
- C. Store materials off construction grounds in a secure location that is a dry, covered area and protected from weather conditions
- D. Inspect and report any freight damages to the manufacturer immediately.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimal results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Perform structural silicone sealant work when air temperature is above 10° F (minus 12° C)

1.09 WARRANTY

- A. Provide manufacturer's limited warranty that all components are warranted for one (1) year for cases of normal use. Many components are also warranted by the original manufacturers for greater lengths of time. Reference original warranty for complete warranty time frames.
- B. Warranty Addendum – Manufacturer offers extended warranties and service contracts on a per job basis.
- C. For polycarbonate glazing, provide glazing manufacturer's standard warranty against defective materials, delamination, seal failure, and defects in manufacturing for up to twenty (20) years.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Product based on one of the following manufacturers:
 - 1. Growspan – Series 2000
 - 2. Stuppy
 - 3. Florian
 - 4. Cross Country Greenhouses

- B. Greenhouse manufacturer is responsible for turn-key project including all components and installation for the greenhouse to function.
- C. Requests for substitutions will be considered in accordance with provision of Section 01 60 00.

2.02 GREENHOUSES

A. Greenhouse –

a. Dimensions

- (1) Width – 16'-0"
- (2) Length – 30'-0"
- (3) Ridge Height – 18'-6"
- (4) Roof Pitch – 6:12
- (5) Eave Height – 10'-0"

b. Configuration

- (1) Attached shed roof topped with straight eave and structural truss/column spacing at 5'-0"

B. Glazing

1. Glazing panels shall be:

- a. 8mm Polycarbonate meeting ASTM D-635 and Class A per ASTM E-84

C. Primary Structural Steel Members

- 1. All steel members shall comply with ASTM A500 dimensional tolerances.
- 2. All steel members shall be galvanized for corrosion resistance.
- 3. Columns shall be fabricated from 4 inch by 4inch steel with minimum yield strength of 50,000 psi.
- 4. Truss top cords will be fabricated from 3 inch by 2-inch steel with minimum yield strengths of 50,000 psi.
- 5. Truss bottom cords will be fabricated from 3 inch by 2-inch steel with minimum yield strengths of 50,000 psi.
- 6. Truss webbing will be fabricated from steel with minimum yield strengths of 50,000 psi. Truss webbing will be attached to top and bottom cords with aluminum connections to enhance corrosion resistance. (Standard is 1.5" square tubing)
- 7. Roof purlins will be 3 inch by 2-inch steel. Purlins will have a bolted connection to trusses.
- 8. Endwalls will be framed with 3 inch by 2-inch rectangular steel tubing with minimum yield strength of 50,000 psi.

9. Gutters are to be extruded aluminum

10. No wood members are allowed to complete structure.

11. No rolled form pipe or round columns allowed.

2.03 GREENHOUSE OPERATIONS EQUIPMENT

A. Ventilation

1. Eave and ridge vent operators – Linear actuator motors designed specifically for the vent application. Motor must be moisture resistant.
2. Horizontal air flow fan(s) (HAF) – Supply and mount fans as shown on approved greenhouse shop drawings. Size and location is to be determined by the professional opinion of the greenhouse manufacturer and is to be shown on the approved greenhouse shop drawings.
3. Exhaust fan(s) – Supply and mount exhaust fans as shown on approved greenhouse shop drawings. Size and location is to be determined by the professional opinion of the greenhouse manufacturer and is to be shown on approved greenhouse shop drawings.
4. Air intake shutter(s) – Supply and mount intake shutters as shown on approved greenhouse shop drawings. Size is to be matched to required exhaust fan(s).

B. Heating

1. Natural gas or LP heater(s) – Supply and mount heater as shown on approved shop drawings. Gas heater to be manufactured by Modine or greenhouse manufacturer approved equal. Gas heater to be sized and located by greenhouse manufacturer and represented on approved greenhouse shop drawings.

C. Shading System(s)

1. Horizontal shade system – Supply and mount horizontal shade system as shown on approved greenhouse shop drawings. Greenhouse shading system to be manufactured with Phifer Shearweave Solar shades or greenhouse manufacturer approved equal. Wiring to be provided by other trade(s).

D. Lighting

1. Grow light(s) – Grow light(s) shall be designed to provide adequate lighting for approved greenhouse bench layout. Grow light(s) to be switchable ballast for both metal halide and high pressure sodium bulb units. Grow lights shall be mounted and located by greenhouse manufacturer. Grow light(s) shall be shown on approved greenhouse shop drawings. Grow lights come outfitted with molded plugs. Wiring of lighting circuit is to be provided by other trade(s).
2. Task light(s) – To be provided by other trade(s).

E. Watering system(s)

1. Misting irrigation – Supply and mount bench mounted misting irrigation. Misting irrigation system shall be manufactured by Damm, Phytotronics (based on final design), or greenhouse manufacturer approved equal. System shall provide adequate coverage for bench area. Plumbing and wiring to be provided by other trade(s).

F. Environmental control system

1. Environmental control system – Supply and mount a fully-functional control system with electrical control cabinets built specifically for the greenhouse based on the approved greenhouse shop drawings. Control system shall be capable of controlling each zone independently using interior zone data and/or exterior data that is supplied by a weather station included in the control system. Environmental control system shall include PC interface software package. System shall include complete electrical drawings and prints for final hook-up. Greenhouse control system shall be represented on the approved shop drawings for system mounting location. Mounting of sensors and weather station shall be the responsibility of greenhouse manufacturer. Wiring of control system, sensors, and weather station shall be provided by other trade(s).
 - a. One day of training and on site commissioning to be completed by the control system manufacturer
 - b. Temperature sensor shall be programmable with an aspirated shield.
 - c. Display shall be set to read air temperature.
 - d. Program with set points for sensor.
- G. Greenhouse Bench(es) - Manufacturer of greenhouse shall also be manufacturer of greenhouse bench system. Greenhouse benches to be shown on approved greenhouse shop drawings. If bench mounted irrigation is selected, irrigation system shall also be represented on the approved greenhouse shop drawings. Greenhouse bench layout shall be coordinated between greenhouse manufacturer and architect for final approval.

2.04 FABRICATION

- A. Fabricate components in accordance with the shop drawings approved by the architect.
- B. All major fabrication shall be done at the manufacturing location and not onsite.
- C. Manufacturer shall remove all burrs and rough edges prior to finish application.
- D. Install all gaskets and tapes at factory, as reasonable.
- E. Disassemble only to the extent necessary for shipping and handling limitations.
- F. Manufacturer shall be notified of any field modification prior to the activity commencing.
- G. All welding shall comply with standards set forth by the American Welding Society.
- H. Grind exposed welds smooth and flush with adjacent surfaces before finishing; restore mechanical finish.
- I. Perform all work in a method that will meet or exceed industry standards.
- J. Isolation membrane materials shall be used to separate dissimilar metals to prevent galvanic corrosion/action between materials.

- K. Fabricate components to allow for accurate and rigid fit of joints and corners. Match components carefully ensuring continuity of line and design. Ensure joints and connections will be flush and weather tight. Ensure slip joints make full, tight contact and are weather tight.
- L. Steel Components
 - 1. Clean surfaces after fabrication and immediately prior to application of primer in accord with manufacturer's recommendations.
 - 2. Apply specified shop coat primer in accord with manufacturer's instructions to provide 1.0 mil (0.05mm) minimum dry film thickness
- M. Fabricate components true to detail and free from defects impairing appearance, strength or durability.
- N. Provide contoured exterior horizontal or purlin glazing retainers to minimize water, ice, and snow buildup.
- O. Reinforce components at anchorage and support points, joints, and attachment points for interfacing work.
- P. Accurately size glazing to fit openings allowing for clearances as set forth by the "Glazing Manual" published by the Flat Glass Marketing Association (FGMA).
- Q. Cut glass clean and carefully. Nicks and damaged edges will not be accepted. Replace all glass with damaged edges.

PART 3 EXECUTION

3.01 PREPARATION

- A. General contractor shall direct, supervise, and inspect all site work related to the greenhouse.
- B. Do not begin installation until substrates have been properly prepared and approved by manufacturer. Substrate preparation shall be done in strict accordance with the approved shop drawings.
- C. If substrate penetration is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Thoroughly clean all surfaces and substrates prior to installation.
- E. Prepare surfaces using the method recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.02 INSTALLATION

- A. Installation of the greenhouse shall be done in accordance with approved shop drawings and manufacturer's instruction and installation manual(s).

- B. Separate dissimilar materials using nonconductive tape, paint, or other material not visible in finished work.
- C. Provide attachments and shims to permanently fasten system to building structure.
- D. Maintain dimensional tolerances and alignment with adjacent work.
- E. Anchor securely in place, allowing for required movement, including expansion and contraction.
- F. Install glazing sealants in accordance with manufacturer's instructions without exception, including surface preparations.
- G. Set sill members in bed of sealant. Set other members with internal sealants to provide weather tight construction.
- H. Install flashings, bent metal closures, corners, gutters, and other accessories as required or detailed.
- I. Clean surfaces and install sealant in accordance with sealant manufacturer's instructions and guidelines.

3.03 ADJUSTING AND CLEANING

- A. Adjust hinge set, locksets, and other hardware for proper operation. Lubricate using a suitable lubricant compatible with door and frame coatings.
- B. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before owner's acceptance.
- C. Any abraded surface of the finish shall be cleaned and touched up with air dry paint, as approved and furnished by the window manufacture, in a color to match factory applied finish.
- D. Remove from project site, and legally dispose of construction debris associated with this work.
- E. Removable sill and head stop provide for greater serviceability of hardware without the need to remove the other panels.

3.04 HOUSEKEEPING

- A. Manufacturer shall deliver all related operating instructions, maintenance manuals, and warranty registration cards to the general contractor during the completion of the project.
- B. Installer shall protect installed products until completion of the installation from all construction debris and natural elements.
- C. Manufacturer is responsible for all touch-up, repair, or replacement of damaged products during the installation.

- D. Installer shall keep area tidy and safe at all times.
- E. Clean and dress all sealant prior to installation completion.
- F. Clean all glass prior to installation completion.
- G. Installer shall clean the entire enclosure one time at the completion of the installation. Cleaning shall include surface cleaning of aluminum framing and glass and clean up of construction debris. All subsequent cleaning shall be the responsibility of the general contractor.

3.05 TESTING

- A. Greenhouse installer shall complete a water test to the AAMA 501.2 standard with AAMA standard equipment with architect or general contractor in presence.
- B. Define all other post installation testing requirements.

3.06 TRAINING

- A. Greenhouse installer shall provide one (1) onsite day of training on operations and maintenance of the greenhouse structure in the presence of all requested parties.
- B. Greenhouse installer shall coordinate onsite visit, commissioning, and training of greenhouse control system by greenhouse control system manufacturer.

3.07 PROTECTION

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

- END OF SECTION 13 34 13.13 -